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CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
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"Omnes res creatae sunt divina sapientiae et potentiae testes, divitiae felicitatis humanae:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex economia in conservatione, proportione, renovatione, *potentia* maiestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper aestimata; à verè eruditis et sapientibus semper exulta; male doctis et barbaris semper inimica fuit."—*LINNAEUS*.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leydon, 1767.

..... The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich, 1818.*

ALERE FLAMMAM.



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THE ANNALS AND MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

".... per littora spargite museum,
Naides, et circum vitreas couadite fontes:
Pollicis virginis teneros hic carpit flores.
Floribus et pictum, diva, replete canistrum.
At vos, o Nymphae Craterides, ita sub undas,
Ite, recurvato variata coralia truncu
Vellite muscois e rupibus, et nithi conchis
Porte, Deas pelagi, et pingui conchylia succo."

N. Parthenis Gannettus, Bol. 1.

No. 7. JULY 1908.

I.—*On some Jurassic Mollusca from Arabia.* By R. BULLEN NEWTON, F.G.S., and G. C. CRICK, Assoc.R.S.M., F.G.S.

[Plates I.-III.]

PRELIMINARY STATEMENT.

THE fossils described in this communication, and which have been presented to the British Museum, were collected by Major H. S. Hazelgrove, of the Indian Army, from localities situated in South-western Arabia—Nobat Dakim and Dihala districts, the former about 50 miles north of Aden and the latter about double that distance also north of Aden. According to the letter and sketch-map accompanying the specimens, those from "Nobat" were obtained about 7 miles from that place in a basaltic region and are in a very dark grey limestone; the "Dihala" fossils, found in a light fawn-coloured rock, were discovered about 15 miles to the north-east of that locality, "at the tops of the small cultivated valleys which run up between the low spurs on which the

villages of Al-Kura and Samma stand," and apparently beneath the "Deccan Trap" series, which rise to a height of about 3500 feet.

PELECYPODA AND GASTROPODA.

By R. BULLEN NEWTON.

Among the specimens from Dihala are examples of *Parallelodon egertonianus*, a species of the Arciform-Pelecy-pods, which has been recorded from the Himalayas (Niti and Spiti) and also from Somaliland, and *Nucula cuneiformis*, previously found at both Spiti and Cutch, a closely related form to the European *N. circaria*, Orbigny (= *N. ornata* of Quenstedt), of Callovian and Oxford Clay horizons.

Only one of the "Nobat" fossils is capable of determination. I refer to the natural limestone cast of a *Nerinea*, which shows strong affinities to *N. devoididi* of Orbigny, belonging to the European Corallian (Sequanian) Series.

These specimens are of interest not only from the fact that they enable us to announce for the first time the presence of a Jurassic fauna in Arabia, but also because they present a facies which connects them with the Bihin Limestone fauna of Somaliland and that of the Spiti Shales of Northern India, although, before pronouncing upon their probable geological age, it will be necessary to briefly consider what is known concerning the horizon of those two remote deposits.

The Bihin Limestone.—From a palaeontological point of view the first notice of the Bihin Limestone of Somaliland is to be found in "A Note on the Geology of Somaliland," published in the 'Geological Magazine' for 1896, p. 290, by Dr. J. W. Gregory *, who gives a list of fossils found at Bihin, 15 miles from Berbera, which were determined by Messrs. G. C. Crick, F. A. Bather, and myself, including *Belemnites subhastatus*, Zieten, *Parallelodon egertonianus*, Stoliczka, *Rhynchonella edwardesi*, Chapuis & Dewalque, and *Rhynchonella subtetrahedra* of Davidson, the presence of which appeared to be of such value that the age of this limestone was regarded as Bathonian.

In further papers of the same journal, and immediately following Dr. Gregory's account, Mr. Crick and myself gave detailed notices of the fossils submitted to us, the *Parallelodon egertonianus* being referred to (pp. 294-296) as originally occurring in Northern Indian in company with several well-known European Jurassic Mollusca determined by Stoliczka

* References to the literature, when not included in the text, will be found further on in the paper under "Bibliography."

and regarded by that author as belonging to Quenstedt's "Brown Jura" or the "Dogger," evidence which was considered at the time in favour of the Bihin Limestone being recognized as of Bathonian age. Mr. Crick's remarks, however (pp. 296-298), on *Belemnites subhastatus* favoured the Callovian age for this limestone, since that Cephalopod was said to be characteristic of the *macrocephalus*-zone of Germany.

At a later period, during the discussion on a paper by Dr. Gregory "On the Geology and Fossil Corals and Echinids of Somaliland," read before the Geological Society, Mr. G. C. Crick stated that the Cephalopoda from the Bihin Limestone "appeared to indicate the presence of an horizon somewhat younger than Bathonian" (Quart. Journ. Geol. Soc. 1890, vol. lvi. p. 45).

Since the Bihin Limestone fossils were described, further specimens in the British Museum have been examined from the same beds, although no published account of them has yet been issued. Among these the following provisional determinations are now made:—*Nerinea cf. elatior*, Orbigny, a Corallian species represented by some narrow elongate natural casts; *Volsella* (= *Modiola*) *subangustissima*, Dacqué, a form found in the Kimeridgian of Western Somaliland (Atschabo); *Pholadomya cf. carinata*, Goldfuss, originally described from the Callovian of the Sarthe region of France, and which has in more modern years been recognized by Douville as part of the Jurassic (Sequanian) fauna of Choa to the south of Abyssinia; *Ceromya cf. striata*, Orbigny sp. (= *obovata*, Roemer, and *infata*, Agassiz), belonging to Corallian and Kimeridgian times, a species recorded by G. Müller as occurring in the Kimeridgian of German East Africa; and *Terebratula subsella*, Leymerie, ranging from Corallian to Kimeridgian, although perhaps more characteristic of the former period, is known from the Kimeridgian of German Somaliland through the researches of Dr. Dacqué, and according to Prof. Douville it also occurs in the Jurassic rocks of Choa to the south of Abyssinia.

The Spiti Shales.—The palaeontology of the Spiti deposits of the Northern Himalaya appears to have been first made known to us by Captain J. D. Herbert in 1831, who gave an account, with a plate of figures, of a number of fossils that had been collected in those beds by Dr. Gerard. This was followed in 1833 by a further notice of the same collection written by the Rev. R. Everest, accompanied by two plates of fossils.

Thirty years afterwards the Gerard collection was again

studied, and this time by the late Dr. H. F. Blanford, who recognized in part an Upper Oolitic character of the species, which he considered were identical with, or closely allied to, forms characteristic of the Oxford Clay.

Dr. Oppel was the next student of this fauna, especially in connection with the Cephalopoda. He noted *Ammonites macrocephalus* as one of the characteristic species, and he therefore regarded the beds as of Callovian age and equivalent to the Kelloways-rock series of Europe.

Then followed Dr. Stoliczka's memoir *, dealing in part with the same subject, in which is enumerated the characteristic fossils of the Spiti Shales, with some remarks as to their horizontal value, as follows:—“The characteristic fossils are *Ammonites macrocephalus*, *parkinsoni*, *curvicosta*, *liparus*, *triplicatus*, and *biplex*; *Astarte major* and *unilateralis*, *Nucula cuneiformis*, *Trigonia costata*, &c.

“Without entering at present on the questions of separate zones, I believe the best equivalent of these beds is Quenstedt's *Brown Jura*, or now usually called *Dogger*, comprising a great number of so-called formations, clays, limestones, sandstones, shales, &c., which have in England, France, Germany, &c. only local value. The Himalayan *Jura* approaches in many respects in the character of its fossils to the Russian. It is a mistaken opinion to regard certain beds which contain *Planulati-Ammonites* as Upper *Jura*. The Spiti Shales have been treated in this manner because they abound in ‘*Planulati*.’ But all those we do find, *Ammonites curvicosta*, *braikenridgii*, *triplicatus*, and the Kimeridgian form of *Am. biplex*, all these species are not Upper but Middle Jurassic; even if we could abstract all the rest of the fossils. *Trigonia costata* proves nothing, as it goes through many strata without essential alteration; similarly the *Avicula inequivalevis*. The Cutch Deposits are equally not of *Upper* but of *Middle Jurassic* age, and have a great number of species identical with the *Oolite inférieur* of Bayeux and Montreuil Bellay.”

These early determinations of the Spiti fossils have been subjected to considerable revision in recent years, and especially so in connection with the Cephalopoda, which have been more closely studied than the other groups of Mollusca.

The latest published views as to the age of the Spiti Shales appear in a monograph by Dr. Carl Diener on the geology of the Central Himalayan region, where the lower beds containing *Belemnites gerardi* are regarded as Upper Jurassic and

* Stoliczka, Mem. Geol. Surv. India, 1865, vol. v. part 1, p. 180.

included in his division of the "Chidamu Beds." The same author states that Professor Victor Uhlig agrees with this correlation, besides thinking it probable that the Chidamu Beds are Kimeridgian*.

It should also be mentioned here that Professor Uhlig is now engaged in examining and reporting upon "The Fauna of the Spiti Shales," descriptions of the Ammonite species having already been published; and we await with interest the completion of that work, which should finally settle all disputes as to the stratigraphical values of those northern Indian deposits.

Age of the Arabian Mollusca.—In considering the geological age of Major Hazelgrove's fossils from Arabia it would seem that there is every evidence to prove that they belong to a higher horizon than the Bathonian. The *Parallelodon egertonianus*, as previously mentioned, shows some similarity with a Kimeridgian form from German East Africa. Then, again, the *Nucula cuneiformis*, which is characteristic of Indian Jurassic deposits, exhibits besides some marked affinities with Quenstedt's *N. ornata*, occurring in the Oxfordian of Germany and England. The *Nerinea*-cast also appears to possess certain characters which would connect it with the Corallian period. From such comparisons it is reasonable to assume that this fauna should be recognized as originating somewhere between the Oxfordian and Kimeridgian, in which case the Corallian (or Sequanian) would represent its rightful period in the Jurassic series.

Every detail of research made in connection with the present enquiry tends to indicate that these Arabian limestones may be correlated with the Jurassic rocks of Bihar and probably other districts of Eastern Africa, as well as with those occurring on the Tibetan side of the Himalayas—the Niti Pass neighbourhood north of Kumaun and the Spiti district N.N.E. of Simla—and with certain rocks in the Cutch province of Western India. Similar Jurassic regions are also known in Persia, Baluchistan, and Madagascar.

DESCRIPTION OF THE SPECIES.

PELECYPODA.

Genus PARALLELODON, Meek and Worthen.

Parallelodon egertonianus, Stoliczka. (Pl. I. figs. 1-4.)

Area, J. D. Herbert, Gleanings in Science, 1881, vol. iii. pl. xvii. fig. 6, p. 272.

* These opinions are reproduced and adopted in Professor A. de Apparent's 'Traité de Géologie,' 1903, edition 5, p. 1255.

Aroa, Everest, Asiatic Researches, 1833, vol. xviii. pt. 2, pl. ii. fig. 27, p. 114.

Cucullaea virgata, Blanford, Journ. Asiatic Soc. Bengal, 1863, p. 136; Blanford and Salter, Palaeontology of Niti, Northern Himalaya, 1865, p. 108; non J. de C. Sowerby, 1840.

Macrodon egertonianum, Stoliczka, Mem. Geol. Surv. India, 1865, vol. v. pl. viii. fig. 7, p. 89.

Parallelodon egertonianus, R. B. Newton, Geological Magazine, 1896, pp. 294-296.

From Stoliczka's diagnosis we understand this species to be an obliquely elongate shell, convex, narrow, and with radiating costæ; the costæ are fewer and consequently wider apart towards the anterior margin and nearly obsolete posteriorly; concentric striæ unequal, undulating, sometimes lamellose. These characters are mostly well expressed in the valves from Arabia now referred to this species, although the posterior radiating costæ are more apparent than in Indian examples, a fact which is probably due to better preservation.

Rather more than eleven years ago I recognized this species among the Bihin Limestone fossils of Somaliland, and I then referred to a peculiarity of ornamentation seen only on the right valve, which had not previously been noticed, viz. the presence of intermittent ribbing between the primary radial costæ, a structure which I also observed at the same time in some of the original Indian specimens in the British Museum collected by the late Sir Richard Strachey, and which is further observable in the valves from Arabia. I now find the same sculpture in J. de C. Sowerby's *Cucullaea virgata* from the Cutch Jurassic, a species which has already been mistaken for *egertonianus*, although it represents a shell of very different contour, being more or less quadrate and, moreover, furnished with almost central umbones, and altogether lacking the obliquity of the Spiti form.

Very similar sculpture is present on the left valve of *Cucullaea lasti*, described by G. Müller (in Bornhardt, 'Deutsch. Ost-Afrika,' 1900, vol. vii. pl. xvii. figs. 1, 2, p. 533) from the Kimeridgian of German East Africa; but that form has also more central umbones, less oblique radial costæ, and rather more inflated valves.

This *egertonianus* is also quite distinct from Dr. Dacque's *Macrodon rufæ** from the Kimeridgian of Western Somaliland (Atschabo and Harro Rufa), as pointed out by that author, who further regards his species as showing a greater

* "Beiträge zur Geologie des Somalilandes," Beitr. Paläontologie Geologie Oesterr.-Ungarns-Oriente, 1905, vol. xvii. pl. xv. figs. 4-6, pp. 137-138.

resemblance to *Arca (Cucullaea?) jonesi* of Tate * from the Uitenhage beds of South Africa.

Like the Indian and African specimens, the Arabian examples are sometimes a good deal crushed, although two of the largest left valves exhibit their natural convexity. The valves also vary in size, the largest having a height of 30 mm. and a length of 54 mm.

The ligament area in most examples is not preserved, but a sectioned left valve shows a fairly deep concavity beneath the umbo, but unfortunately without surface structure; this same specimen exhibits evidence of the elongate horizontal teeth at the posterior end of hinge-line, which serve to indicate the generic position of this species.

Loc. Near Dihala.

Genus NUCULA, Lamarck.

Nucula cuneiformis, J. de C. Sowerby.

(Pl. I. figs. 5-7.)

Modiola, J. D. Heribert, Gleanings in Science, 1831, vol. iii. pl. xvii. fig. 5, p. 272; Everest, Asiatic Researches, 1833, vol. xviii. pt. 2, fig. 28, p. 114.

Nurula, J. de C. Sowerby, Asiatic Researches, 1833, vol. xviii. pt. 2, p. 278.

Nucula? cuneiformis, J. do C. Sowerby, Trans. Geol. Soc. London, 1840, ser. 2, vol. v. pl. xxii. fig. 4, p. 328.

Nucula cuneiformis, H. F. Blanford, Journ. Asiatic Soc. Bengal, 1803, vol. xxxii. p. 135.

Nucula cuneiformis, Stoliczka, Mem. Geol. Surv. India, 1865, vol. v. p. 90.

Among the Arabian specimens are some inflated examples of a *Nucula* which show so great a resemblance to *N. cuneiformis* from the Jurassic rocks of Spiti and Cutch that I am unable to separate them from that species.

In Sowerby's original description of the shell it is stated to be "transversely elongate-elliptical, gibbose, smooth; beaks † close to the anterior extremity, small, incurved."

Unfortunately the type of the species is missing from Capt. C. W. Grant's collection of Cutch fossils in the Geological Society's Museum, although I am enabled to institute comparison, as there happens to be an example of this shell (determined by myself) in the Rev. J. F. Blake's collection

* Quart. Journ. Geol. Soc. 1867, vol. xxiii. pl. ix. fig. 9, p. 161.

† It may be here mentioned that *Nucula* is one of the few genera which has posteriorly directed umbones (opisthogyrous); therefore the position of the "beaks" should be referred to as posterior, and not anterior.

of fossils from that area of India, now in the British Museum. The late Dr. H. F. Blanford recognized some distorted specimens from the Himalayan Jurassics, previously figured by Herbert and Everest as *Modiola* and by J. de C. Sowerby as *Nucula*, as forms of the *N. ? cuneiformis*, an opinion which was subsequently confirmed by Stoliczka in his memoir dealing with the Spiti Shales of the North-western Himalaya.

The Arabian shells show distortion through pressure as characterize most of the Spiti examples; their valves are of similar size and ornamentation, just as inflated, possessing incurved posterior umbones, the surface of posterior end being abruptly truncated and mostly occupied by a wide lunule. The characteristic dentition of the genus has been displayed by the rubbing down of the dorsal surface of one of the specimens.

The Cutch specimen used for comparison exhibits rather more roundness of contour, although the slightly angulate appearance of the Arabian valves is probably more or less due to the pressure to which they have been partially subjected during the period of fossilization.

Accompanying the specimens of *Nucula cuneiformis* are some very depressed valves which have probably undergone lateral pressure, making it possible that they belong to the same species; a rubbed down surface of one of these valves exhibits the characteristic nuculoid dentition.

Among European shells this species is closely related to *Nucula ornata* of Quenstedt ('Handbuch Petrefactenkunde,' 1852, pl. xliv. fig. 7, p. 528) from Kelloways Rock and Oxford Clay horizons, a form subsequently recognized by Albert Oppel as *Nucula cæcilia* of Orbigny ('Prodrome Pal. Strat.' 1849, vol. i. p. 339; 'Die Juraformation,' 1857, p. 565) of Callovian age. The same form has also been figured under the name of *N. ornata*, Quenstedt, from the Oxford Clay of Weymouth, in Robert Damon's 'Geology of Weymouth,' 1888, pl. ii. figs. 6-8), the types of which are in the British Museum.

Loc. Near Dihala.

GASTROPODA.

Genus TROCHUS, Linnaeus.

Trochus arabiensis, sp. n. (Pl. I. figs. 8, 9.)

Description.—Shell conical, smooth, and with subobtuse apex; with five depressed, narrowly sutured, slightly turreted whorls on nearly the same plane, which are more or less

concave on the upper surface, the last having a sharply carinated periphery; base inflated and doubtfully umbilicate; aperture apparently subcircular; sculpture comprising fine, closely arranged, regular spiral striations both on the upper and basal surfaces, crossed by oblique lines of growth which are strongest and most evident at the base; lower margin of whorls obscurely tubercled.

Dimensions.—Height = 22, diameter = 18 mm.

The two specimens now described somewhat resemble the genus *Amberleya*, though not so prominently turreted as most known forms of that genus, and of much less decorative sculpture than usually obtains. I know of no form of Jurassic Trochidæ similarly ornamented. About twelve of the regular spiral lines can be counted on the surface of the penultimate and body-whorl (where they are best seen), and there are slight indications of tubercles on the periphery, although the specimens are somewhat worn and coated in places with the light-coloured matrix.

The base is fairly ventricose, but whether there is an umbilication or not is very uncertain, as the hard limestone covers up this part of the basal region.

The form is of interest to record as it accompanies the shells found in the light-coloured limestone, and unquestionably forms part of the same fauna, although its relationship to other species has not been traced. There is, however, a slight similarity of structure to a form figured by Dr. Dacqué (*Trochus* sp. indet.) from the Kimeridgian of Somaliland (Atschabo), but without specimens for actual examination a more accurate comparison is not possible (pl. xvi. fig. 8, p. 142 of Dacqué's memoir, quoted in the list of literature), although a peripheral keel is present on the lower whorl.

Loc. Near Dihala.

Genus NERINÆA, Defrance.

Nerinæa cf. desvoidyi, Orbigny. (Pl. I. fig. 10.)

Nerinæa desvoidyi, Orbigny, Prodrome Paléontologie Stratigraphique, 1850, vol. ii. p. 4; Pal. Française, Terr. Jurassiques, Gastéropodes, 1850, pl. cclxi. p. 107.

Nerinæa goem, Contejean, Kimméridien de Montbéliard, 1859, pl. vii. fig. 1, p. 231; (pars) Thurmann and Etallon, Lethæa Bruntrutana, 1864, pl. vii. fig. 38, p. 93, non Römer.

Nerinæa desvoidyi, P. de Loriol, Mon. Paléont. Géol. Étages Sup. Jurassique, Mém. Soc. Linn. Normandie, 1872, vol. xv. pl. vi. figs. 2-5, p. 81; Blake and Hudleston, Quart. Journ. Geol. Soc., 1877, vol. xxxiii. p. 266.

This specimen is a natural cast of a large fragment of

Nerinea, and regarded as having close affinities with *N. desvoidyi* from the Corallian (Sequanian) rocks of France. It measures 125 mm. in length and consists of rather more than six whorls of greater width than height, each one showing an oblique central depression which is parallel with a well-marked suture. The general form is narrow and elongate, the whorls very gradually enlarging with age, and appearing to exactly correspond with P. de Loriol's figures of a cast from Normandy (pl. vi. figs. 3, 4) which exhibits a similar rate of increase in the volutions and the same obliquity at the median depression. A small patch of original shell-structure is still to be seen on the basal whorl, although not included in our illustration, showing some obscure lines of growth, which, however, are less sinuous than those depicted by Orbigny in his original figure.

The present specimen shows also considerable resemblance to Römer's *N. gosae*, as interpreted by Goldfuss ('Petrefacta Germaniae,' 1844, vol. iii. pl. clxxv. fig. 9, p. 41), from the German Portlandian; but the whorls appear to be higher and the suture more oblique.

A very similar cast of this genus has been figured and described by Coquand under the name of *N. pauli* from the Lower Cretaceous (Barremian) deposits of the Province of Constantine in Northern Africa ('Géologie et Paléontologie Constantine,' 1862, pl. iv. fig. 3), but it is capable of separation from the present form by its taller volutions and their more deeply excavated sides.

Messrs. J. F. Blake and W. H. Hudleston acknowledge this species in the Corallian strata of Weymouth.

The blackish limestone containing this specimen has also produced a few casts of naticoid and bivalve shells; but these are of no scientific importance, as their determination is quite impossible.

Loc. Near Nobat.

CEPHALOPODA.

By G. C. CRICK.

As has already been explained, Major Hazelgrove's collection was obtained at two localities in S.W. Arabia—(1) in the neighbourhood of Nobat Dakim, about 50 miles north of Aden, and (2) from the neighbourhood of the villages of Al-Kura and Samma, to the N.E. of Dihala, about 100 miles N. of Aden. In a letter accompanying the specimens Major Hazelgrove writes:—"I have marked the seven dark specimens 'Nobat,' though I found them about seven miles from

that place, at the end of a long valley which runs north from Nobat Dakim. All the remaining fossils were found at the tops of the small cultivated valleys which run up between the low spurs on which the villages of Al-Kura and Samma stand; and there were several more neighbouring valleys of the same sort, with fossils in them in similar situations."

According to the sketch-map accompanying the specimens, the fossils marked "Nobat" were found between layers of basalt on the western side of Jebel Manif (2500 feet), about 7 miles N.N.E. from Nobat Dakim. The villages of Al-Kura and Samma, near which the remaining fossils were found beneath Deccan trap, are at a distance of about 15 miles N.E. of Dihala.

Only one Cephalopod (the Belemnite) is labelled "Nobat." It is, however, to be observed that the small portions of matrix still adhering to this specimen agree perfectly with the matrix of the fossils from near Dihala, whilst its state of preservation differs entirely from that of the other specimens labelled "Nobat."

The Cephalopoda comprise two Nautili, five Ammonites, and one Belemnite. A perfectly flat and smooth internal cast, about 40 mm. in diameter, without any indication whatever of sutures, is possibly the remains of an Ammonite. The Nautili and Ammonites are contained in a light fawn-coloured limestone; they are all very much crushed, and in no single instance is it possible to make out a suture-line. Portions of matrix on the Belemnite indicate that that also was obtained from similar rocks.

DESCRIPTION OF THE SPECIES.

A. NAUTILOIDEA.

Genus NAUTILUS, Breyne.

Nautilus cf. hexagonus, J. de C. Sowerby.
(Pl. II. fig. 2.)

1826. *Nautilus hexagonus*, J. de C. Sowerby, Min. Conch. vol. vi. p. 55, pl. dxxix. fig. 2. (For references, see A. H. Foord, Cat. Foss. Ceph. Brit. Mus. pt. 2, 1891, pp. 235-236.)

Using the name in a broad sense, the genus *Nautilus* is represented by two examples, about 90 and 95 mm. in diameter respectively. Both are doubtless referable to the same species, but are so very much crushed that their original dimensions cannot now be ascertained. The shell appears to have been rather inflated and rapidly expanding, and

to have had its greatest thickness at the margin of the umbilicus. This seems to have been relatively small and may possibly have been closed, but unfortunately it is obscured in both specimens. The sides are flattened and convergent and their outer half is slightly concave; the periphery is flattened, is about one-half the width of the sides, where the shell has a diameter of about 90 mm., and has subangular margins, and in one specimen there is a shallow longitudinal groove almost close to the margin. The whole surface is ornamented with rather coarse lines of growth, which in crossing the whorl pass from the umbilical margin across the lateral area in a slightly backward direction, and with a feeble oral-concave curve at about the middle of this area as far as the subangular peripheral margin, where they turn rather abruptly backward, so as to form a relatively deep hyponomic sinus on the periphery. The position of the siphuncle is not seen, and the septa are not shown.

In its crushed condition, showing only the ornaments of the test, and neither the position of the siphuncle nor the form of the suture, its identification is rendered extremely difficult.

The Arabian fossil bears much resemblance to *Nautilus hexagonus*, described by J. de C. Sowerby * from the Calcareous grit of Shotover, Oxfordshire, and of Abingdon, Berkshire †, &c., the ornaments of the test corresponding exactly with those shown in Sowerby's figure; but the Arabian species appears to have had relatively a narrower periphery. The specimen from near Charee, in Cutch, that J. de C. Sowerby ‡ referred with a query to that species because it differed "in having a smaller umbilicus and in being more rounded," is referred to *Nautilus calloviensis*, Oppel §, by Waagen ||, who states that in Cutch it is found in beds associated with *Macrocephalites macrocephalus*. From the Upper Jurassic rocks of Mombasa in East Africa Beyrich ¶ records a fragmentary specimen as being allied to *Nautilus hexagonus*.

* J. de C. Sowerby, Min. Conch. vol. vi. p. 65 (1826), pl. dxxix. fig. 2.

† The species has also been recorded in rocks ranging from the Stonesfield Slate (Great Oolite, Bathonian) up to the Kimeridge Clay (see A. H. Foord, Cat. Foss. Ceph. Brit. Mus. pt. 2, 1891, pp. 235-236), but it is very doubtful if all these records refer to Sowerby's species.

‡ J. de C. Sowerby, Trans. Geol. Soc. [2] vol. v. pt. 2, 1840, p. 329, pl. xxiii. fig. 4, expl. of plate (unpaged). This specimen is now in the Museum of the Geological Society of London.

§ A. Oppel, 'Die Juraformation,' 1858-8, p. 547 (1857).

|| W. Waagen, 'Jurassic Fauna of Kutch' (Pal. Indica), vol. i. Cephalopoda, pt. 1, 1873, p. 18, pl. iii. figs. 2 a, b.

¶ H. E. Beyrich, "Ueber Hildebrandt's geologische Sammlungen von Mombasa," Monatsber. d. k. Preussischen Akad. d. Wissenschaften zu Berlin, 1878, pp. 767-775.

In its general form the Arabian species possibly closely resembled the form which Dacqué * has described (as *Nautilus enniatus*) from Somaliland from beds which he regards as of Kimeridgian age. The Somaliland fossil has a similar subangular-margined periphery, but its ornaments are unknown.

The concave peripheral area of *Nautilus giganteus*—a species sometimes regarded † as a synonym of J. de C. Sowerby's *Nautilus hexagonus*—described by d'Orbigny ‡ from the Lower Oxfordian, but recorded § also from beds of Lower Kimeridgian age, seems to distinguish that species from both the Arabian and Somaliland forms.

Of the species recorded from the Jurassic rocks of Cutch, the Arabian form may be compared with both *Nautilus kumagunensis*, Waagen ||, and *Nautilus wandaensis*, Waagen ¶; from the former, however, it seems to be distinguished by its coarser lines of growth and apparently more robust form, and from the latter by its probably narrower and more sharply defined periphery. On the whole, however, it seems to come nearer the latter, but unfortunately in that species the test, which is very well shown in the present specimens, is incompletely known. *Nautilus kumagunensis* occurs in the upper region of the *macrocephalus*-beds, whilst *N. wandaensis* occurs in the Dhosa Oolite in association with *Aspidoceras perarmatum*. *Nautilus wandaensis* has also been recorded, in association with *Perisphinctes*, *Macrocephalites*, indeterminable fragments of *Belemnites*, and a new species of *Rhynchonella*, from Mtaru in German East Africa, from rocks regarded as of the same age as the Dhosa Oolite ** of Cutch.

The flat, sharply-defined periphery, with its subangular margins and feeble longitudinal sulcus near the margin, the slight depression of the outer part of the lateral area, and the direction of the lines of growth in the Arabian example

* E. Dacqué, Beitr. zur Paläont. u. Geol. Oesterr.-Ungarns, &c., Bd. xvii. Heft 3 & 4, p. 144, pl. xvii. fig. 5.

† See A. H. Foord, Cat. Foss. Ceph. Brit. Mus. pt. 2, 1891, pp. 235-236.

‡ A. D. d'Orbigny, Pal. Franç., Terr. jurass. vol. i. 1842, p. 163, pl. xxxvi.

§ A. Etallon, "Lethaea Bruntrutana, &c.," pt. 1 (Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften, Bd. xviii.), 1861, p. 74, pl. i. fig. 2.

|| W. Waagen, "Jurassic Fauna of Kutch" (Pal. Indica), vol. i. Cephalopoda, pt. 1, 1873, p. 19, pl. iii. figs. 1 a, b.

¶ W. Waagen, op. cit. pt. 1, 1873, p. 17, pl. iv. figs. 3 a, b.

** A. Tornquist, "Fragmente einer Oxfordfauna von Mtaru im Deutsch-Ostafrika, nach dem von Dr. Stuhlmann gesammelten Material," Jahrb. Hamburgischen Wissensch. Anstalten, Jahrg. x. (1892), p. 281.

suggest a comparison with Retowski's genus *Tithonoceras**, which was founded upon a new species *T. zitteli* † from the Tithonian of the Crimea, but the depression of the outer portion of the lateral area and the longitudinal sulcus on the periphery near its margin are not nearly so distinct as in that genus, and there is an absence of any depression along the median line of the periphery—in fact, in the Arabian specimens the periphery is feebly convex, whilst in the genus *Tithonoceras* it is rather concave.

The Arabian species appears to be intermediate between such a form as *Nautilus hexagonus* and the genus *Tithonoceras*, and probably finds a near ally in Dacqué's *Nautilus enniatus* from the Kimeridgian rocks of Atschabo in Somaliland.

Loc. Valleys between the villages of Al-Kura and Samma, about 15 miles N.E. of Dihala.

B. AMMONOIDEA.

Genus PERISPINCTES, Waagen.

With one possible exception, the Ammonites in the collection are referable to the genus *Perisphinctes*. All are more or less imperfectly preserved, but, though very much crushed, portions of the test are usually present. In no case, however, is it possible to see the suture-line. The condition of the specimens, therefore, renders the identification of the species particularly difficult.

Perisphinctes cf. *torquatus* (J. de C. Sowerby).
(Pl. III. figs. 1 a, b.)

- 1840. *Ammonites torquatus*, J. de C. Sowerby, Trans. Geol. Soc. [2] vol. v. pt. 2, p. 719, pl. lxi. fig. 12 & expl.
- 1863. ? *Ammonites torquatus*, J. de C. Sowerby; H. F. Blanford, Journ. Asiatic Soc. Bengal, vol. xxxii. no. 2, p. 130, pl. iii. figs. 6, 6 a, 7, 7 a, 8.
- ? 1865. *Ammonites torquatus*, J. de C. Sowerby; H. F. Blanford, in J. W. Salter and H. F. Blanford, Palaeont. Nati, p. 80.
- 1875. *Perisphinctes torquatus* (J. de C. Sowerby); W. Waagen, Jurassic Fauna of Kutch (Pal. Indica), vol. i. Cephalopoda, pt. 4, p. 191, pl. liv.
- 1898. *Perisphinctes torquatus* (J. de C. Sowerby); J. v. Siemiradzki, Palaeontographica, Bd. xlv. p. 263.

The best-preserved Ammonite in the collection was partially exposed on the surface of a small slab of limestone.

* O. Retowski, "Die tithonischen Ablagerungen von Theodosia," Bull. Soc. Imp. Nat. Moscou, 1893, no. 2 & 3, p. 222.

† O. Retowski, op. cit. p. 223, p. xiii. figs. 2 a, b. e.

By careful development it has been possible to almost completely expose the lateral area and a portion of the periphery (Pl. III. figs. 1 *a*, *b*). In its crushed state the fossil has the following dimensions:—diameter of outer whorl 92 mm. (1) *; height of outer whorl 30 (0·326); width of umbilicus about 39 (0·42); the thickness of the whorl being indeterminable. There are 42 or 43 principal ribs in the outer whorl; each, after traversing the narrow umbilical wall of the whorl, passes forward in crossing the lateral area and bifurcates at about the middle of this area into two equally strong ribs, which cross the periphery without any interruption in an orad-convex curve. Occasionally, but very rarely, there is a principal rib which does not bifurcate. There is no trace of the suture-line.

The fossil is most probably referable to J. de C. Sowerby's *Ammonites torquatus*. The type-specimen, which came from the "Desert N.E. of Cutch" †, has the following measurements:—diameter of shell 64·5 mm.‡ (1); height of outer whorl 21·5 (0·33); thickness of outer whorl 23 (0·35), and width of umbilicus 28 (0·43). The outer whorl bears 41 principal ribs. Thus it will be seen that both in measurements and ornaments the Arabian shell approaches very closely the Cutch form. In his work on the Jurassic Cephalopoda of Cutch, Waagen § figures only a large completely septate example, and states that all the specimens in the Museum of the Geological Survey of India came from "the coarse red iron-sandstone of the Katrol range, that is, from the middle region of the Katrol Group." It is stated to be one of the commonest Ammonites of the Katrol Group ||. The ornaments of the Arabian fossil agree very closely with those of the larger of the two specimens (figs. 6, 6 *a*) from the Spiti Valley figured by H. F. Blanford ¶, and referred by him with a query to Sowerby's species. Unfortunately neither the suture-line nor the form of the transverse section is available for comparison in the Arabian fossil. The

* The numbers in parentheses accompanying the dimensions measured in millimetres indicate the proportion of each of them to the whole diameter taken as unity.

† *Op. cit.* p. 719. The specimen is now in the Museum of the Geological Society of London.

‡ The specimen is 68 mm. in diameter, but owing to the imperfection of its anterior end its dimensions can be best taken at a diameter of 64·6 mm.

§ W. Waagen, *op. cit.* pt. 2, 1875, p. 191, pl. liv.

|| R. D. Oldham, *Manual Geol. India*, 1898, p. 222.

¶ H. F. Blanford, *Journ. Asiatic Soc. Bengal*, vol. xxxii. 1863, p. 130, pl. iii. figs. 6, 6 *a*, 7, 7 *a*, 8.

absence of these same characters prevents a full comparison with the Niti examples, which H. F. Blanford referred to *Ammonites torquatus** and *A. biplex*†, two forms very closely allied, if not identical, the only characters by which that author distinguished the two forms being the thicker and more depressed whorls of the former, accompanied by a slight notching of the ribs in the median line of the periphery. He did not figure *A. torquatus*, but figured two examples as *A. biplex*. Of these, the specimen depicted in pl. xi. fig. 1 a ‡ more closely resembles the Arabian form, especially in the coarseness and direction of its ornaments, but being a more widely umbilicated shell, its outer whorl bears a greater number (55) of principal ribs than that of the Arabian fossil.

Compared with Waagen's figure § of *Perisphinctes martelli*, Oppel, from the Kuntkote Sandstone, the measurements of which agree fairly well with those of the Arabian specimen, the latter possessed coarser and more curved ornaments, and apparently had more inflated sides than the Indian form; further, the bifurcation of the ribs appears to have been nearer the margin of the periphery in the Indian than in the Arabian form.

Another Indian form with which the Arabian specimen may be compared is Waagen's *Perisphinctes virguloides* ||, but compared with Waagen's figure (pl. xlix. figs. 1 a, 1 b) the Arabian fossil is more narrowly umbilicated and its ribs are less numerous per whorl and more forwardly-directed in crossing the lateral area. In Cutch, Waagen's species is restricted to the Kuntkote Sandstone. The Arabian fossil agrees still more closely with Pavlow's figure of a specimen, which he refers to Waagen's species, from the zone of *Aspidoceras acanthicum* from the East of Russia ¶.

It also closely resembles de Loriol's figure** of *Perisphinctes eupalus* (d'Orbigny) from the zone of *Oppelia tenuilobata* of Oberbuchsitten (Soleure); its relative dimensions are about

* H. F. Blanford, in J. W. Salter and H. F. Blanford, Palæont. Niti, 1865, p. 80.

† H. F. Blanford, *op. cit.* p. 79, pl. xi. figs. 1 a, b, c, pl. xii. figs. 1 a, b, c.

‡ Now in British Museum collection, register no. C. 5083.

§ W. Waagen, *op. cit.* pt. 4, 1875, pl. iv. figs. 3 a, b.

|| W. Waagen, *op. cit.* pt. 4, 1875, p. 203, pl. xlvi. figs. 4 a, b, pl. xlix. figs. 1 a, b.

¶ A. Pavlow, "Les Ammonites de la zone à *Aspidoceras acanthicum* de l'est de la Russie," Mém. Com. Géol. St. Pétersbourg, vol. ii. no. 3, 1886, pp. 28 & 85, pl. vii. figs. 3 a, b.

** P. de Loriol, "Monographie paléontologique des couches de la zone à *Ammonites tenuilobatus* (Badener Schichten) d'Oberbuchsitten et de Wengen (Soleure)," pt. i., 1881 (Mém. Soc. Pal. Suisse, vol. vii.), pl. iii. figs. 2, 2 a.

the same, so far as they can be compared with the Arabian specimen, although the measurements of the figure do not quite agree with the dimensions given by de Loriol (p. 16)*; but its ornaments appear to be somewhat finer and fewer, de Loriol's example having 47 principal ribs in the outer whorl, whereas the Arabian fossil has only 42 or 43.

This specimen, then, seems to find its nearest ally in *Perisphinctes torquatus*, which occurs in the Katrol Group in Cutch in beds which are referred to by Siemiradzki † as Lower Kimeridgian; at Niti and Spiti in the Himalaya; and, according to Siemiradzki, also in the zone of *Oppelia tenuilobata* in Poland, and probably also in Swabia.

A crushed specimen, about 34 mm. in diameter, exposed on the surface of a small piece of limestone, appears to be referable to this same species.

Loc. Valleys between the villages of Al-Kura and Samma, about 15 miles N.E. of Dihala.

Perisphinctes cf. subdolus, Fontannes.
(Pl. 11, fig. 3.)

1879. *Perisphinctes subdolus*, F. Fontannes, Description des Ammonites des calcaires du Château de Crussol, Ardèche (Zones à *Oppelia tenuilobata* et *Waggonia beckeri*), p. 61, pl. ix, fig. 3.

1898. *Perisphinctes subdolus*, F. Fontannes; J. v. Siemiradzki, Palaeontographica, Bd. xlvi. Lief. 2 & 3, p. 153.

Another species of the genus *Perisphinctes*, represented by the crushed half of a specimen of about 83 mm. in diameter and with the inner whorls obscured by matrix, bears some resemblance in the character of its ribbing to *Perisphinctes subdolus*, Fontaines, a rather common species in the zone of *Oppelia tenuilobata* of Crussol (Ardèche); but it appears to have been a more widely umbilicated shell with relatively narrower (i. e. less high) whorls, for the diameter of its umbilicus at about its greatest diameter (=1) appears to be

* The measurements given by de Loriol are:—greatest diameter 78 mm.; width [height] of last whorl, in proportion to the diameter, 0·37; thickness of last whorl, in proportion to the diameter, 0·34; diameter [width] of umbilicus, in proportion to the diameter, 0·87. From these dimensions it would appear that the width [height] of the last whorl and the diameter of the umbilicus were equal, but such is not the case in de Loriol's figure. Our dimensions of the figure are:—greatest diameter 79·5 mm. (1); height of last whorl 27 (0·34); thickness of last whorl 28 (0·35); width of umbilicus 68·5 (0·42).

† J. v. Siemiradzki, "Palaeontographica," Band xlvi. Lief. 4 & 5, 1898, p. 264. A. de Lapparent divides the Katrol group into two parts, and regards the Lower part as of Sequanian age and the Upper as of Kimeridgian age ("Traité de Géologie," 5th ed., 1906, vol. ii, pp. 1243 & 1256).

about 42 mm. (0·50) and the height of the outer whorl about 25 mm. (0·30), whereas these proportions in an example of Fontaunes's species of 81 mm. in diameter are given as 0·45 and 0·31 respectively.

Loc. Valleys between the villages of Al-Kura and Samima, about 15 miles N.E. of Dihala.

Perisphinctes cf. abadiensis, Choffat.
(Pl. III, fig. 2.)

1893. *Perisphinctes abadiensis*, P. Choffat, Faune jurass. Portugal, Cephalopodes, 1^{re} sér., Ammonites du Lusitanien &c. p. 46, pl. xviii. figs. 1, 2.

1898. *Perisphinctes abadiensis*, P. Choffat; J. v. Siemiradzki, Palaeontographica, Bd. xlv. Lief. 4 & 5, p. 164.

The crushed remains of an example of about 100 mm. in diameter, exhibiting only a portion of the outer whorl, the inner whorls being obscured by matrix, seems to agree very well with Dacqué's figure * of a specimen, from rocks of Kimeridgian age in Somaliland, that he compares with Choffat's species from Portugal †. Siemiradzki ‡ records the species also from Poland.

It bears also considerable resemblance to de Loriol's figure § of *Perisphinctes polygyratus* (Reinecke) from the zone of *Oppelia tenuilobata* of Oberbuchsitten (Soleure).

Loc. Valleys between the villages of Al-Kura and Samima, about 15 miles N.E. of Dihala.

Perisphinctes cf. pottingeri, J. de C. Sowerby, sp.
(Pl. III, figs. 3 a, b.)

1840. *Ammonites pottingeri*, J. de C. Sowerby, Trans. Geol. Soc. [2] vol. v. p. 719, pl. lxi. fig. 10 & expl. of figure.

1875. *Perisphinctes pottingeri* (J. de C. Sowerby); W. Waagen, Jurassic Fauna of Kutch, völ. i. Cephalopoda, pt. 4, p. 183, pl. li. figs. 1 a, b.

1894. *Perisphinctes pottingeri* (J. de C. Sowerby); K. Futterer, Zeitschr. Deutsch. geol. Gesell. Bd. xlvi. p. 7, pl. i. fig. 2.

1898. *Perisphinctes pottingeri* (J. de C. Sowerby); J. v. Siemiradzki, Palaeontographica, Bd. xlv. Lief. 2 & 3, p. 157.

A fragment of a whorl about 32 mm. long exhibits rather

* E. Dacqué, Beitr. zur Paläont. u. Geol., Oesterr.-Ung. &c. Bd. xvii. Heft 3 & 4, 1905, p. 148, pl. xv. figs. 15 a, b.

† Paul Choffat, loc. cit.

‡ J. v. Siemiradzki, loc. cit.

§ P. de Loriol, "Monographie paléontologique des couches de la zone à *Ammonites tenuilobatus* (Badener Schichten) d'Oberbuchsitten et de Wengen (Soleure)," pt. i. 1881 (Mém. Soc. Pal. Suisse, vol. vii.), pl. vi. fig. 4.

coarse ribs, showing a definite bifurcation on the lateral area into two equally coarse ribs which pass without interruption over the peripheral area. Unfortunately the specimen is so imperfect that it does not exhibit the whole height of the whorl, and it is so crushed that it does not show the original shape of the transverse section of the whorl. The ornaments appear to be relatively coarser than those of the other examples of *Perisphinctes* in the collection; the character of the bifurcation of the ribs is also slightly different, there being in this fragment a slight thickening at the point of bifurcation. The ribbing, in fact, agrees very closely with that of the earliest portion of the outer whorl of Sowerby's type specimen of *Perisphinctes pottingeri*, with which we have compared it. Sowerby's type specimen came from the "Desert N.E. of Cutch." According to Waagen, this species and the closely allied but more coarsely ornamented form *Perisphinctes katrolensis** are in Cutch very common in the coarse iron-sandstone of the Katrol range that corresponds to about the middle of the Katrol Group. Dr. Waagen regarded the Cephalopoda of this group as corresponding to those of the Kimeridgian and Upper Oxfordian beds of Europe. The group is divided into two parts, of which de Lapparent regards the Lower as of Sequanian and the Upper as of Kimeridgian age.[†]

Loc. Valleys between the villages of Al-Kura and Samina, about 15 miles N.E. of Dihala.

1826.

at

Genus OPPELIA, Waagen.

Oppelia? sp. (Pl. III. fig. 4.)

The flattened remains of a smooth minutely umbilicated shell about 39 mm. in diameter are probably referable to the genus *Oppelia*, but the fossil is too imperfect to be specifically determined.

Loc. Valleys between the villages of Al-Kura and Samina, about 15 miles N.E. of Dihala.

C. BELEMNOIDEA.

Genus BELEMNITES, Lister.

Belemnites cf. hastatus, H. D. de Blainville.

(Pl. II. figs. 1 a, b, c.)

1827. *Belemnites hastatus*, H. D. de Blainville, Mém. sur les Bélemnites, p. 71, pl. i. fig. 4, pl. ii. fig. 4, pl. v. fig. 8.

* W. Wangen, op. cit. p. 4, 1875, p. 184, pl. lxxii.

† A. de Lapparent, 'Traité de Géologie,' 5th ed. 1903, vol. ii. pp. 1243 & 1250.

1842. *Belemnites hastatus* (pars), Blainville; A. D. d'Orbigny, Pal. Franç., Terr. jurass., vol. i. p. 121, pl. xviii.

1848. *Belemnites semi hastatus rotundus*, F. A. Quenstedt, Cephalopoden, p. 440, pl. xxix, fig. 8.

1857. *Belemnites hastatus*, Blainville; A. Oppel, Juraformation, p. 546.

1870. *Belemnites hastatus*, Blainville; J. Phillips, Brit. Belemnitidae (Mon. Pal. Soc.), pt. 5, p. 111, pl. xxviii, figs. 67-70.

1873. *Belemnites cf. hastatus*, Blainville; W. Waagen, Jurassic Fauna of Kutch, vol. i. Cephalopoda, pt. 1, p. 11.

1876. *Belemnites hastatus*, Blainville; E. Favre, Description des Fossiles du terrain oxfordien des Alpes Fribourgeoises (Mém. Soc. Pal. Suisse, vol. iii.), p. 17, pl. i. figs. 1 a, b, c, 2, 3.

This genus is represented by a single specimen, apparently a portion of the posterior part of the guard. The fragment is feebly depressed and slightly hastate; it is truncated at each end, and at the anterior end there is no indication of the alveolus. The specimen is 64 mm. long; the ventro-dorsal and transverse diameters of the anterior end are 11 mm. and 12·75 mm. respectively, the corresponding diameters of the posterior end being 11 mm. and 12 mm. respectively. The dorsal and ventral surfaces are nearly parallel throughout the greater part of the length of the specimen, and it is only at a short distance from the posterior end of the fossil that they show any tendency to converge. In either a dorsal or ventral aspect the specimen is feebly hastate, and has its greatest width (15 mm.) at about 22 mm. from the posterior end. A ventral groove extends over the whole length of the specimen, being sharply defined at the anterior end and becoming wider and shallower towards the posterior extremity; the dorso-lateral area is slightly flattened and exhibits somewhat obscurely two dorso-lateral lines. The fossil seems to have formed part of a rather elongated guard, since it exhibits no trace of the alveolus at its anterior end.

The fossil appears to belong to the *Hastati*-group (= *Hibolithes*, Montfort *), and to be nearly allied to *Belemnites hastatus* †, but the guard is less fusiform and the ventral groove reached nearer the apex than in most examples of that species. But the extent of the ventral groove varies in examples which have been referred to this species. Thus Favre ‡ has referred to this species an example from the Oxfordian of the Alps of Fribourg in which the ventral groove

* D. de Montfort, Conchyl. Syst. vol. i. 1808, p. 386. Zittel includes this section in *Belamnopsis*, Bayle, which he regards as a subgenus of *Belemnites* (Grundzüge d. Paläont. 1895, p. 441; 2te Aufl. 1903, p. 475).

† D. de Montfort, loc. cit. See also H. D. de Blainville, Mém. sur les Belemn. 1827, p. 71, pl. i. fig. 4, pl. ii. fig. 4, pl. v. fig. 3.

‡ E. Favre, Description des fossiles du terrain oxfordien des Alpes Fribourgeoises (Mém. Soc. Pal. Suisse, vol. iii. 1876), pl. i. figs. 1 a, b, c.

extends to within a short distance of the posterior end of the guard; the Arabian specimen agrees very well with the median portion of such a form, but its ventral groove is relatively narrower. *Belemnites hastatus* is widely distributed and attains its maximum development in the zone of *Peltoceras biarmatum* (Lower Oxfordian). In England the species occurs throughout the Oxford Clay, and has also been recorded from the Calcareous Grit *. Besides occurring in Europe, fragments comparable with this species have been recorded from Cutch † from the portions of the Charee group ranging from the zone of *Reineckia anceps* through the zone of *Peltoceras athleta* up into the zone of *Aspidoceras perarmatum*, i. e. from the Lower Oxfordian up into the Corallian. The species has also been recorded from the Jurassic rocks of Hermon ‡.

The specimen bears considerable resemblance to *Belemnites persicus*, Weithofer §, from the Upper Jurassic (*tenuilobatus*-beds) of North-west Persia, but the transverse section of that species is more nearly circular.

The hastate and depressed character of the fossil seems to ally it also to Etallon's *Belemnites astartinus* ||. The extent of the ventral groove, however, differs very much in the figured examples which have been referred to this species. Thus in Etallon's type specimen from the Astartian of the Beyseze Jura the groove extends over about two-thirds of the length of the guard; in an example figured by de Loriol ¶ from the beds of the zone of *Ammonites tenuilobatus* of Baden (Argovia) it extends over about one-half the length of the guard; in an example figured by the same author ** from the same horizon at Oberbuchsitten (Soleure) the groove is almost entirely confined to the anterior third of the guard,

* J. Phillips, *op. cit.* pt. 5, 1870, p. 112.

† W. Waagen, Jurassic Fauna of Kutch (Pal. Indica), vol. i. The Cephalopoda, Introduction.

‡ Fritz Noedding, 'Der Jura am Hermon,' 1887, p. 33, pl. v. fig. 10.

§ K. A. Weithofer, Sitzungsber. d. k. Akad. d. Wissenschaft., Wien, math.-naturw. Cl., Bd. xcvi. Heft 8-10, 1890, p. 757, pl. i. fig. 4.

|| A. Etallon, Lethaea Bruntrutana &c. pt. i. (Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften, Bd. xviii.), 1861, p. 74, pl. i. fig. 1.

¶ P. de Loriol, Monographie paléontologique des couches de la zone à *Ammonites tenuilobatus* (Badener Schichten) de Baden (Argovie), pt. i. 1876 (Mém. Soc. Pal. Suisse, vol. iii.), p. 12, pl. i. figs. 14 & 15.

** P. de Loriol, Monographie paléontologique des couches de la zone à *Ammonites tenuilobatus* (Hadener Schichten) d'Oberbuchsitten et de Wangen (Soleure), pt. i. 1881 (Mém. Soc. Pal. Suisse, vol. vii.), p. 7, pl. i. fig. 6.

whilst in a specimen figured also by de Loriol* from the Upper Rauracian of the Bernese Jura the groove extends over about one-half the length of the guard. Further, there are differences in the amount of tapering of the anterior part of the guard, none of the examples mentioned above tapering so rapidly as Etallon's type-specimen. *Belemnites astartinus* does not appear to have usually attained such a large size as the Arabian fossil, the only figured example of that species at all comparable with the present specimen being that figured by de Loriol from the zone of *Ammonites tenuilobatus* at Oberbuchsitten (Soleure), but that tapers anteriorly more rapidly and has a considerably shorter groove.

It is neither so fusiform, so depressed, nor so widely grooved as the example figured by Quenstedt ('Die Cephalopoden,' 1849, pl. xxix. figs. 14 a-c) as *Belemnites hastatus depressus* (= *Belemnites calloviensis*, Oppel †). Compared with the form figured as *Belemnites subhastatus* by Waagen from the Jurassic rocks of Cutch, in which species Waagen includes the Cutch specimen figured by J. de C. Sowerby ‡ as *Belemnites canaliculatus* ?, and afterwards renamed by d'Orbigny § *Belemnites grantanus*, the Arabian specimen appears to be part of a more elongated guard and to have possessed a much narrower ventral groove. Waagen || records *Belemnites subhastatus* as being not very common in the Cutch Jura, where it is apparently restricted to the beds with *Macrocephalites macrocephalus*.

The Arabian specimen is more depressed, more hastate, and provided with a narrower ventral groove than Waagen's *Belemnites kunkholensis* ¶, which, according to that author, ranges in Cutch through the Katrol and Oomia groups, or, in other words, from the Upper Oxford to about Lower Tithonian beds; whilst it appears to have been more elongated and more depressed than that author's *Belemnites katrolensis* **, a species which in Cutch is characteristic of the

* P. de Loriol, Étude sur les mollusques du rauracien supérieur du Jura Bernois, Suppl. 1, 1895 (Mém. Soc. Pal. Suisse, vol. xxii.), p. 5, pl. i. fig. 1.

† A. Oppel, 'Die Juraformation,' 1858-8, p. 543 (1857). See also W. Waagen, Jurassic Fauna of Kutch (Pal. Indica), vol. i. The Cephalopoda, pt. 1, 1873, p. 14, pl. ii. figs. 4 a-d.

‡ J. de C. Sowerby, Trans. Geol. Soc. [2] vol. v. pt. 2, 1840, pl. xxiii. fig. 2 & expl.

§ A. d'Orbigny, Prod. de Paléont. 1850, vol. i. p. 326.

¶ W. Waagen, Jurassic Fauna of Kutch (Pal. Indica), vol. i. The Cephalopoda, pt. 1, 1873, p. 16.

|| W. Waagen, ibid. pt. 1, 1873, p. 3, pl. i. figs. 3 a-f.

** W. Waagen, ibid. pt. 1, 1873, p. 7, pl. ii. figs. 7, 8, 9.

Katrol group, although according to Waagen it seems to pass up into the Oomia group.

Compared with *Belemnites tanganensis*, which Futterer * described from Tanga, in German East Africa, from rocks of Oxfordian age, the Arabian specimen appears to have belonged to a stouter and relatively more elongated guard, with a narrower ventral groove than that species, and similar differences are recognizable on comparison with the Belemnite fragments described by the present writer † from Bihin in Somaliland.

Lob. The specimen is labelled "Nobat," indicating, as stated by Major Hazelgrove in his letter accompanying the collection, that it was found about 7 miles from that place, at the end of a long valley which runs due north from Nobat Dakim. It is to be observed, however, that its mode of preservation is unlike that of the rest of the fossils similarly labelled, and that some fragments of matrix adhering to the specimen are identical with the matrix of the fossils from the N.E. of Dihala, and differ entirely from the matrix of the other Nobat specimens.

CONCLUSIONS.

From the foregoing descriptions it will be seen that these Arabian Jurassic Cephalopoda are allied, on the one hand, to such forms as occur in the Katrol Group of Cutch, the Upper Jurassic rocks of Niti and Spiti in the Himalaya, and the Upper Jurassic rocks of Somaliland; and, on the other hand, to forms occurring in the zone of *Oppelia tenuilobata* in Central Europe.

The Katrol Group in Cutch consists of two parts. According to Waagen ‡ the lower portion—the Kuntkote Sandstone—is the equivalent of the Upper Oxfordian beds of Central Europe, and probably represents the zones of *Peltoceras bimammatum* above and of *Peltoceras transversarium* below. The upper part—the Katrol sandstone and shales—comprises a complex group of strata several hundred feet in thickness, and may therefore, as Waagen pointed out, represent more than one palaeontological horizon. The Katrol sandstone is well marked off both from the beds above as well as from the beds below, for, according to Waagen, only one

* K. Futterer, "Zeitschr. Deutsch. geol. Gesell. Bd. xlvi. (1894) p. 30, pl. v, figs. 2, 2 a-c, 3, 3 a-c.

† G. C. Crick, Geol. Mag. [4] vol. iii. (1896) pp. 296-8.

‡ W. Waagen, 'Jurassic Fauna of Kutch,' vol. i. The Cephalopoda, Introduction and pp. 230-232.

species of Cephalopoda (*Belemnites kunkotensis*) reappears in the bed from the Kunikote Sandstone below, and not a single species passes from this bed into the higher beds—the Oomia group. Waagen recognized only four European species in the Katrol Sandstone, all of which belong to the beds with *Aspidoceras acanthicum*. Hence he considered the Katrol Sandstone to be of Kimeridgian age and to be the equivalent of the zones of "*Perisphinctes*" *mutabilis* and *Oppelia tenuilobata*, a view generally adopted by subsequent writers*.

De Lapparent † refers the lower part of the Katrol Group to the Sequanian and the upper part to the Kimeridgian.

The fossiliferous deposits in the neighbourhood of the villages of Al-Kura and Samma, to the north-east of Dihala, are certainly of Upper Jurassic age, and are most probably homotaxial with the upper part of the Katrol Group in Cutch and with the zone of *Oppelia tenuilobata*, or the beds with *Aspidoceras acanthicum*, in Europe.

In his article on the "Jurassique" in the 'Grande Encyclopédie' (vol. xxi. 1895, pp. 322-331) Prof. Dr. E. Haug gives (p. 330) a map—after Neumayr and the more recent works of Nikitin, Rothpletz, and Hyatt—showing the distribution of sea and land during Upper Jurassic times. A Central Mediterranean sea is represented extending from the northern part of India on the east, over the western part of Asia, and almost the whole of Europe, as far as Central America on the west. From this sea a gulf—termed the Ethiopian gulf—is indicated, extending from the neighbourhood of Cutch and the southern part of Baluchistan in a south-westerly direction, terminating at the south between Madagascar and Africa. This excludes the whole of Arabia, but includes on the west Somaliland, a portion of Abyssinia, and the eastern coast of Africa as far south as the south of Madagascar, and on the east the north-western part of Madagascar.

The present discovery by Major Hazelgrove shows that the northern part of this gulf should include also the south-west part of Arabia.

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A. ON THE PALÆONTOLOGY OF ARABIA.

At present our knowledge of the sedimentary formations of

* See H. B. Medlicott and W. T. Blanford, Manual Geol. India, 2nd ed. (by R. D. Oldham), 1893, pp. 217 *et seqq.*; J. W. Gregory, 'Jurassic Fauna of Cutch,' vol. ii. pt. 2, The Corals, 1900, p. 2.

† A. de Lapparent, 'Traité de Géologie,' 5^e ed. 1906, vol. ii. pp. 1243 & 1255.

Arabia appears to be limited to the rocks of Arabia Petrea in the north, mostly the Sinai neighbourhood, where Carboniferous, Cretaceous, and Tertiary beds have been distinguished by their fossils, due to the researches of J. W. Salter, Ralph Tate, Rothpletz, Duncan, Fourtan, &c. Cretaceous fossils are also known from Ras Fartak and Ras Sharwen on the south coast, which were first referred to by Dr. H. J. Carter and subsequently recognized by Dr. P. M. Duncan as of Cenomanian age; while the Tertiary rocks, mostly of Lutetian or Middle Eocene age, are to be found in the neighbourhood of Muskat (Ras Ghissa &c.) in the south-eastern corner of the country, which were originally recorded by the late Dr. H. J. Carter, and more recently referred to by Mr. G. C. Crick and myself.

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EXPLANATION OF THE PLATES.

PLATE I.

Parallelodon egertonianus, Stoliczka, sp. (Page 5.)

Fig. 1. External lateral view of a left valve.
Fig. 2. Interior of the left valve of another specimen, showing partial dental characters.
Fig. 3. Magnified view of external surface-structure.
Fig. 4. Dorsal aspect of a smaller specimen with both valves.

Nucula cuneiformis, J. de C. Sowerby. (P. 7.)

Fig. 5. Dorsal view of specimen with both valves.
Fig. 6. Internal section of another specimen with both valves, showing dentition.
Fig. 7. Posterior end of another form with both valves, showing the wide lunule, $\times 2$.

Trochus arabiensis, sp. n. (P. 8.)

Figs. 8, 9. Views of separate specimens, fig. 9 being more inflated at the base.

Nerinea cf. desvoidyi, Orbigny. (P. 9.)

Fig. 10. Natural cast, showing the median excavation of the whorls.

PLATE II.

Fig. 1. *Belemnites cf. hastatus*, Blainville. 1 a, ventral aspect, exhibiting the narrow ventral groove, widening out and becoming shallower at the posterior end; 1 b, view of anterior end of the same specimen; 1 c, view of posterior end of the same. The specimen is labelled "Nobat." (P. 19.)

Fig. 2. *Nautilus cf. heragonus*, J. de C. Sowerby. Lateral aspect, showing subangular margin of periphery and the growth-lines of the test. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 11.)

Fig. 3. *Perisphinctes cf. subdolus*, F. Fontaines. Lateral aspect of specimen, the inner whorls of which are obscured by matrix. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 17.)

PLATE III.

Fig. 1. Perisphinctes cf. torquatus, J. do C. Sowerby, sp. 1 a, lateral aspect; 1 b, a portion of the periphery at the point marked with a cross in 1 a. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 14.)

Fig. 2. Perisphinctes cf. abadiensis, P. Choffat. Lateral aspect of exserted portion of fossil, the rest being obscured by matrix. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 18.)

Fig. 3. Perisphinctes cf. pottingeri, J. de C. Sowerby, sp. 3 a, lateral aspect of fragment; 3 b, peripheral view of the same. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 18.)

Fig. 4. Oppelia? sp. A smooth internal cast probably referable to this genus. Near the villages of Al-Kura and Samma, 15 miles N.E. of Dihala. (P. 19.)

Note.—Except where notified, the figures on these Plates are drawn of the natural size.

II.—Descriptions of Two new Cyprinodontid Fishes from West Africa. By G. A. BOULENGER, F.R.S.

Fundulus arnoldi.

Depth of body $4\frac{1}{2}$ to $5\frac{1}{4}$ times in total length, length of head 3 to $3\frac{1}{2}$ times. Snout a little shorter than eye, the diameter of which is $3\frac{1}{2}$ times in length of head; lower jaw projecting beyond upper; interorbital width $\frac{2}{3}$ length of head. Dorsal 15–16, originating slightly in advance of anal, above tenth or eleventh scale of lateral line, and at equal distance from eye and from root of caudal; longest (posterior) ray quite as long as head in males, shorter in females. Anal 15–17, similar to dorsal. Pectoral about $\frac{2}{3}$ length of head. Caudal rounded in females, with upper and lower rays produced in males. Caudal peduncle twice as long as deep. Scales 25–27 in longitudinal series, 20–22 round body; an interrupted series of lateral line pits. Pale olive, spotted or dotted with crimson on the head, body, and vertical fins. According to Mr. Arnold's coloured sketches, the male has a blackish band along the upper part of the dorsal and anal fins.

Total length 45 mm.

Several specimens were presented to the British Museum by Mr. J. P. Arnold, of Hamburg; this fish, which he kept in his aquarium, formed part of an interesting series brought

over alive from the mouths of the Niger. *F. arnoldi* is allied to *F. bivittatus*, Lönnb., and *F. loennbergii*, Blgr., but differs from both in the more numerous anal rays.

Haplochilus liberiensis.

Depth of body $5\frac{1}{2}$ to 6 times in total length, length of head 4 times. Snout a little shorter than eye, the diameter of which is $3\frac{1}{2}$ times in length of head; lower jaw projecting a little beyond upper; interorbital width half length of head. Dorsal 11, originating above fourth or fifth ray of anal and sixteenth scale of lateral line, and at equal distance from head and from root of caudal. Anal 15-16. Pectoral about $\frac{2}{3}$ length of head. Caudal rounded, nearly as long as head. Caudal peduncle twice as long as deep. Scales 33 in longitudinal series, 20 round body; an interrupted series of lateral line pits. Yellowish to dark olive, with darker blotches; dorsal and anal fins with small blackish spots.

Total length 36 mm.

Two female specimens from Monrovia, Liberia, presented by Mr. Arnold.

This species is very closely allied to *H. cameronensis*, Blgr., differing in the more anterior position of the dorsal fin.

III.—*Description of a new Silurid Fish of the Genus Synodontis from South Cameroon.* By G. A. BOULENGER, F.R.S.

Synodontis pardalis.

Depth of body $4\frac{1}{2}$ to $4\frac{3}{4}$ times in total length, length of head $3\frac{1}{2}$ to $3\frac{1}{2}$ times. Head $1\frac{1}{2}$ times as long as broad, granulate above; snout obtusely pointed, $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as postocular part of head; eye supero-lateral, its diameter $4\frac{1}{2}$ to $5\frac{1}{2}$ times in length of head, $1\frac{1}{2}$ to $2\frac{1}{2}$ times in interorbital width; praemaxillary teeth forming a short and broad band; movable mandibular teeth about half diameter of eye, 15 to 20 in number; maxillary barbel not distinctly margined, extending to anterior third of pectoral spine; mandibular barbels with tubercular branches, outer twice as long as inner and half as long as head. Gill-openings not extending downwards beyond root of pectoral spine. Occipito-nuchal shield granulate like the occiput, obtusely tectiform, a little

longer than broad, with posterior processes truncate. Humeral process granulate, not keeled, little longer than broad, obtusely pointed, extending nearly as far back as occipito-nuchal process. Skin without villosities. Dorsal I 7; spine as long as head, feebly curved, striated, serrated behind. Adipose dorsal as long as or a little shorter than its distance from rayed dorsal. Anal IV 7. Pectoral spine strongly serrated on both sides. Caudal fin deeply notched, crescentic. Caudal peduncle about as long as deep. Pale brown above, white beneath; head with numerous small round dark brown spots; body with large round dark brown spots, the ground-colour between them forming a light network; fins white, with more or less regular black bands, 5 to 7 across dorsal, 3 or 4 across ventral and anal, 7 to 11 on caudal.

Total length 200 mm.

Mr. G. L. Bates obtained several specimens of this handsome fish at a waterfall of the Libi River, near the Ja River (Congo System), into which it flows.

IV.—*On a new Genus of Snakes from Brazil.*

By G. A. BOULENGER, F.R.S.

AMONG some snakes from Brazil, submitted to me for identification by Dr. Vital Brazil, Director of the Serumtherapeutic Institute of S. Paulo, I was highly pleased to find a large specimen which represents a species which has hitherto escaped attention. In its physiognomy, head-shields, vertical pupil, and dentition it agrees with the genus *Oxyrhopus*, differing, however, in the scaling of the body, the scales being in 25 rows, those of the vertebral row distinctly enlarged. After some hesitation, I have decided not to place the snake in the genus *Oxyrhopus*, but to propose for it a new genus, which may be called *Rhachidelus*.

Rhachidelus brasili.

Eye moderately large, its diameter equal to its distance from the oral border and $\frac{2}{3}$ the length of the snout, which is rounded, rather strongly depressed, and scarcely projecting. Rostral once and two-thirds as broad as deep, the portion visible from above measuring one-third its distance from the frontal; internasals nearly as long as broad, two-thirds the length of the prefrontals; frontal pentagonal, as long as

broad, twice as broad as the supraocular, as long as its distance from the rostral, a little shorter than the parietals; nostril large, between two nasals; loreal longer than deep; one praœocular, not reaching upper surface of head; two post-oculars; temporals 3+4; eight upper labials, fourth and fifth entering the eye; five lower labials in contact with the anterior chin-shields, which are larger than the posterior. Scales smooth, with distinct paired apical pits, in 25 rows, those of the median row enlarged and nearly as long as broad. Ventrals 184; anal entire; subcaudals 80, the last 28 paired, the rest single. Dark brown above, strongly iridescent, with very indistinct traces of darker cross-bars; dark brown beneath, with small irregular yellowish blotches.

Total length 1320 mm.; tail 310.

A single male specimen from near the city of São Paulo.

V.—Description of a new Newt.

By G. A. BOULENGER, F.R.S.

[Plate IV.]

Molge macrosoma, sp. n.

Body cylindrical, much elongate, $4\frac{1}{2}$ times as long as the head; distance between the limbs $2\frac{1}{2}$ times the distance between the end of the snout and the fore limb. Tail shorter than head and body, compressed, with dorsal and ventral crests, the muscular part thick. Head once and $\frac{1}{2}$ as long as broad, moderately depressed, its depth once and $\frac{1}{2}$ in its width; snout short, rounded; eyes small; no labial lobes; a ligamentous fronto-squamosal arch. Palatine teeth forming two nearly straight series, parallel and well separated from each other in front, feebly divergent behind, not extending forwards beyond the line of the choanae. Limbs widely separated when pressed against the body. Third finger much longer than second; third toe slightly longer than fourth. Skin feebly warty; no dorsal crest or vertebral groove; a strong gular fold; no parotoids; no large pores on the head and sides. Uniform black, except the tips of the toes, the cloacal lips, and the lower edge of the tail, which are yellow.

	mm.
Total length	175
From snout to vent	93
Length of head	17
Width of head	18
Fore limb	27
Hind limb	27
Tail	82

The unique specimen, a female, was brought alive to Capt. Flower at Cairo five years ago by Ismail Bey Chakir, and has now been sent to me by the former with the remark that it may possibly be of European origin, the Bey having bought the newt from a dealer in Vienna. But it is quite distinct from any European newt, being more nearly related to *Molge crocata* (*Neurergus crocatus*, Cope, *Molge strauchi*, Stdr.) from Asia Minor, and unquestionably represents an undescribed species.

The specimen has been presented by Capt. Flower to the British Museum.

EXPLANATION OF PLATE IV.

Molge macrosoma, female, natural size, with enlarged view of palate.

VI.—*Amphipoda from the Auckland Islands.*

By ALFRED O. WALKER, F.L.S., F.Z.S.

[Plate V.]

ON the return of the National Antarctic Expedition to New Zealand in March 1904 the Aucklands were used as a rendezvous for the vessels of which it was composed. During the stay of the 'Discovery' Mr. Hodgson took the opportunity of making a collection of Amphipoda, with the results given below. The arrangement is that of Mr. Stebbing in 'Das Tierreich.'

Fam. *Lysianassidæ*.

(Genus *LYSIANASSA* ?, M.-Edw.

A single female or young specimen, length 4.5 mm., remarkable for the structure of the third uropods: these are small and have the peduncle elevated near the middle in a subtriangular ridge; the outer ramus is very small, with a terminal joint, the inner rudimentary. The telson is square, entire, concave, and curved upwards, with a spine at each of the free angles. In other respects, as far as can be judged without dissection, the animal is a *Lysianassa*.

Fam. *Pontogeneiidæ*.

Genus *ATYLOIDES*, Stebbing.

Atyloides aucklandicus, sp. n. (Pl. V. figs. 1, 2.)

Laurie Harbour: two specimens and the anterior half of a smaller one.

Third pleon-segment with the hind epimeral margin convex; posterior angle produced in a small tooth, above which is a minute denticle.

Eyes irregularly oval, oblique, large, and dark.

Antenna 1 rather longer than 2, about half as long as the body; appendage 1-jointed, shorter than the first joint of the flagellum.

Antenna 2 : peduncle rather longer than that of antenna 1 ; second joint shorter than third.

Maxilla 1 : inner plate with 7 setæ, diminishing in length downwards.

First gnathopods : side-plates wide-oblong, with rounded angles, not distally widened, the front margin slightly concave; second joint subequal to the hand, strong; wrist subequal to the hand in length and width, triangular, not cup-shaped, very setose behind; hand oval, palm undefined, with setiferous ridges on both margins. Dactylus about one-third as long as the hind margin.

In the young specimen the wrist is only one-third as long and half as wide as the hand, not much produced behind; the hand is wide-oval, the palm distinctly defined by an obtuse angle and a group of strong spines and as long as the hind margin. Dactylus slender, as long as the palm.

The second gnathopods are like the first, but larger.

Peræopods 3-5 with second joint wide-oval, faintly serrate behind.

Telson about as long as the sixth pleon-segment, rather longer than the width at the base, cleft fully two-thirds of its length, ends of divisions rounded, slightly dehiscent; an upright spine near the middle of the outer margin and another near the end.

Length 10 mm.

Distinguished by the form of the gnathopods and telson. The difference between the former in old and young is remarkable; the specimens agree in other respects, and appear to have been taken together, but unfortunately the whole pleon is wanting in the small specimen.

Paramæra austrina (Bate), var.

Terror Cove, Port Ross, 16/3/04. One female, with ova; length 7.5 mm.

Differs from the forms described in the 'Challenger' Report under the names of *Atyloides australis* (Miers) and *A. assimilis*, Stebbing, in the third pleon-segment, which has the hind epimeral margin forming a semicircle with the

lower margin without teeth, and the telson which is not much longer than wide at the base and cleft for one-third of its length with the ends of the divisions rounded.

Genus AUCKLANDIA, nov.

Antenna 1 shorter than antenna 2, with short accessory flagellum.

Gnathopods dissimilar.

Otherwise as *Paramara*.

Aucklandia enderbyi, sp. n. (Pl. V. figs. 3, 4.)

Enderby I., 19/3/04. One female with ova; length 10 mm.

Head without rostrum. Ocular lobe rounded. Eyes large, dark, long-reniform. Pleon-segment 3: postero-lateral angle obtuse, hind and lower margins straight.

Antenna 1: flagellum long and slender, the first joint as long as the next three, the following joints increasing in length successively; accessory appendage one-jointed, half as long as the first joint of the flagellum, subconical, with two long terminal setæ.

Antenna 2: peduncle considerably longer than that of antenna 1, second and third joints subequal; flagellum more slender than in antenna 1.

Gnathopod 1: side-plate oblong, rounded below, width two-thirds of length, rather concave in front. Limb robust, second joint about as long as fifth and sixth united and as wide as the fifth; fourth prominent, with convex hind margin; wrist rather longer than the hand, with setiferous ridges on the hind margin; hand widening abruptly below the palm, which is rectangularly transverse and defined by a spinous prominence, outside of which is a scabrous border extending some distance down the hind margin. Finger short, barely reaching the prominence.

Gnathopod 2: more than one-third longer than gnath. 1; second joint subequal to the next three and as wide as the fifth; this is subequal to the hand in length and width; hand narrow-oblong, more than twice as long as wide, with fascicles of pectinate setæ on the hind margin; palm obliquely transverse, defined as in gnath. 1, but the prominence smaller. Finger as in gnath. 1.

Pereopod 2: side-plate almost as wide as deep; about half of the hind margin excavate; second joint narrow.

Pereopods 3-5: second joints wide-oval, obscurely serrate behind.

Uropod 1: peduncle nearly twice as long as the subequal rami.

Uropod 2: outer ramus shorter than inner, which is shorter than the peduncle.

Uropod 3 extending much beyond 2; rami subequal, longer than the peduncle, spiniferous.

Telson not much longer than the width at the base, cleft two-thirds of its length, ends of divisions rounded, dehiscent.

Characterized by the structure of the gnathopods.

Fam. Talitridæ.

Genus ORCHESTIA.

Orchestia aucklandiae, Sp. Bate, Cat. Amph. Crust. Brit. Mus. p. 17, pl. i. a, 3.

Enderby I., 19/3/04. Many males and females.

Segments of the peræon smooth, without transverse ridges. Hind epimeral margin of the third pleon-segment straight; obtusely serrate, with spinules between the teeth; hind angle right, a little produced backwards.

Eyes round-oval, the longer diameter subequal to that of the base of ant. 2.

Ant. 1 not quite reaching the end of the penultimate joint of the peduncle of ant. 2; flagellum in the male with 4 subequal joints, in the female 3-jointed, the first the longest.

Ant. 2: last joint of peduncle the longest; flagellum rather longer than the peduncle, 18-jointed in both sexes.

Gnathopod 1, ♂: side-plate narrowed and rounded below. Wrist twice as long as the hand, both joints with a prominent pellucid process; that on the hand forming the palm and furnished with a row of small spines. Finger reaching a little beyond the process. In the female the limb is similar, but slighter, and the pellucid processes much less prominent.

Gnathopod 2, ♂: wrist short, not produced behind; hand almost as wide as long; palm transverse, rather oblique, in one specimen slightly convex in the middle, in another with a distinct concavity near the base of the finger, spinulose and defined by a strong tooth, hind margin subequal to the palm. Finger nearly straight, extending beyond the tooth.

Gnathopod 2, ♀: wrist longer than the hand, a pellucid process on both, that of the hand with a double row of spines on the upper part and a single row at the base of the dactylus, which does not reach the end of the process.

Peræopod 1 longer than 2; in both the second joints are about twice as wide as the fourth; dactylus divided by a false joint, the proximal part constricted.

Peræopod 3 almost reaching the end of the fifth joint of per. 4; second joint wide-oval, obscurely serrate and rounded behind.

Peræopod 4 shorter than 5 which has the second joint angulate and slightly serrate behind, fourth and fifth joints not enlarged in male.

All the limbs are sparsely covered with short spines.

Telson spoon-shaped, slightly truncate, with spinous margins.

Length of male 20 mm.; female 15 mm.

This species is treated in the 'Tierreich' as identical with *O. serrulata*, Dana, which is described as having the peræon-segment "encircled by a raised ridge," and gnathopod 1 in the female as having the sixth joint "slightly narrower at apex than base." In Spence Bate's description this limb is said to differ from the male "in being longer and slighter," and his figure agrees with the specimen described in having the sixth joint distinctly wider at the apex; the animal is said to be "very smooth." But for the absence of the expansion of the fourth and fifth joints in peræopod 5 of the male (and it is by no means certain that the specimens examined were sexually adult) this species might well be referred to *O. gammarellus*, Pallas [= *O. littorea* (Mont.)].

Genus HYALE, Rathke.

*Hyale trigonochir**, sp. n. (Pl. V. figs. 5-7.)

Enderby I., east of Bay. Many males; four females.

Peræon-segments subequal; pleon-segments diminishing in length successively, the third with hind margin rather concave and obscurely crenate, lower margin rather convex, angle subacute. First four side-plates as deep as the segments. Head longer than first segment. Eyes moderate, oblong, widening below.

Male.—Antenna 1 reaching a little beyond the end of the peduncle of ant. 2, about as long as the head; flagellum longer than peduncle, 12-jointed.

Antenna 2 reaches almost to the third body-segment, third joint the longest; peduncle and first fifteen joints of flagellum densely setose beneath; flagellum almost twice as long as the peduncle, 20-jointed.

Gnathopod 1: side-plate about as wide as long, widening and rounded below. Second joint very stout; wrist more than half as long as the hand and two-thirds of the width of

* In allusion to the triangular hand of gnathopod 1 in the male.

its base, the front and hind margins subparallel, the latter with a spinous tubercle; hand subtriangular, palm very oblique, straight, setose and spinous, and defined by two stout spines; hind margin about one-fourth as long as the palm, with which it forms a rounded and setose angle. Dactylus very stout, about two-thirds as long as the palm.

Gnathopod 2: side-plate suborbicular. Second joint longer than third and fourth united; wrist very small, not produced behind; hand oboviform, the width near the base nearly three-fourths of the length; palm undefined; hind margin almost straight, but swollen and rounded at the base, densely setose. Dactylus about half as long as the hind margin.

Female (with ova).—Antenna 1 reaching the end of the fourth joint of the flagellum of ant. 2; flagellum 12-jointed.

Gnathopod 1: side-plate rounded below, with a prominent tooth on the upper part of the hind margin. Second joint stout, rather longer than the next two; wrist less than half as large as the hand, the hind margin slightly produced; hand subovoid, front margin very convex, about twice as long as the hind; palm oblique, shorter than the hind margin. Dactylus as long as the palm.

Gnathopod 2: side-plate and whole limb like gnathopod 1, but rather larger.

Peraopod 2: second joint narrow, fourth twice as wide as the fifth. Branchial vesicle wide-ovate.

Peraopod 5: second joint as wide as long, fourth and fifth joints widening distally and terminated by a fringe of spines.

Uropod 3: ramus subequal to peduncle, 3 or 4 distal spines on each.

Telson divided to the base; divisions quadrate, with rounded angles.

Length of male 20 mm.; female 12 mm.

The form of gnathopod 1 in the male is the most salient character.

Genus *ALLORCHESTES*, Dana.

Allorchestes novizealandiae, Dana.

Enderby I., 19/3/04. Two males; length 12 mm.

It is difficult to see why Prof. Della Valle (and, doubtless following him, Mr. G. M. Thompson *) should have referred this species to *Hyale prevostii*, M.-Edw. The structure of the wrist in gnathopod 2, ♂, proves it to be an *Allorchestes*.

* Trans. N. Z. Inst. 1898, vol. xxxi. pp. 197-207.

EXPLANATION OF PLATE V.

Fig. 1. Atyloides aucklandicus, sp. n. First gnathopod.
Fig. 2. Ditto, young. First gnathopod.
Fig. 3. Aucklandia nderbyi, sp. n. First gnathopod.
Fig. 4. Ditto. Second gnathopod.
Fig. 5. Hyale trigonochir, sp. n. First gnathopod, male.
Fig. 6. Ditto. Second gnathopod, male.
Fig. 7. Ditto. Second gnathopod, female.

VII.—A Synopsis of the Sharks of the Family Squalidæ.

By C. TATE REGAN, M.A.

THE Squalidæ may be diagnosed as sharks without an anal fin, with five or six gill-openings on each side, the last in front of the base of the pectoral fin, which is normally shaped, and with the mouth inferior.

Fourteen genera may be recognized.

Synopsis of the Genera.

I. Snout normal, not produced into a saw-like rostrum. (*Squalineæ*)

A. Mouth crescentic.

Each dorsal fin preceded by a spine 1. *Centroscyllium*.
 No fin-spines 2. *Echinorhinus*.

B. Mouth transverse, but little arched, with a straight oblique groove on each side.

1. Mouth rather small; body trihedral, the flat lower surface marginated on each side by a strong dermal fold; dorsal fin-spines present 3. *Oxyntus*.

2. Mouth wide; body elongate, subcylindrical.

a. Each dorsal fin preceded by a spine, which may project or may be small and concealed.

Teeth in the upper jaw erect, tricuspid or pentacuspid; lower teeth oblique, unicuspids, with points strongly deflected laterally 4. *Spinax*.
 Teeth in both jaws oblique, unicuspids, with points strongly deflected laterally 5. *Squalus*.
 Upper teeth erect, lanceolate, two-rooted; lower teeth erect, triangular 6. *Scymnodon*.
 Upper teeth erect, lanceolate, two-rooted; lower teeth oblique, with points deflected laterally 7. *Centroscymnus*.
 Upper teeth erect or somewhat oblique, triangular, with quadrate bases; lower teeth oblique, with points deflected laterally 8. *Centrophorus*.

- b. Dorsal fin-spines vestigial or absent; teeth in the upper jaw erect, unicuspis, lanceolate or narrow triangular.
- a. Caudal fin elongate; teeth in the lower jaw erect, triangular, finely serrated 9. *Scymnorhinus*.
- β.** Caudal fin short and deep; lower teeth not serrated.
 - *. Lower teeth oblique, with points strongly deflected laterally; dorsal fins subequal in length, the first far in advance of the pelvics 10. *Somniosus*.
 - **. Lower teeth erect, triangular.

Dorsal fins subequal in length, the first very slightly in advance of the pelvics 11. *Isistius*.

Second dorsal fin much longer than the first, which is not far in advance of the pelvics 12. *Euprotomicrus*.

II. Snout produced into a flat blade, armed with a series of teeth on each side; no fin-spines. (*Pristiophorinae*)

Five gill-openings on each side; rostral teeth not serrated 13. *Pristiophorus*.

Six gill-openings on each side; larger rostral teeth with serrated posterior edges 14. *Pliotrema*.

1. CENTROSCYLLIUM.

Centroscyllum, Müll. & Henle, Plagiost. p. 191 (1841).

Paracentroscyllum, Alcock, Ann. & Mag. Nat. Hist. (6) iv. 1889, p. 379.

Teeth small, compressed, tricuspid or pentacuspid; mouth wide, arched. Each dorsal fin preceded by a spine; first dorsal well in advance of the pelvics. Dermal denticles small, scattered, each with stellate base and a short, erect, pointed cusp.

Three or more species from deep water in the Atlantic and Indo-Pacific.

Synopsis of the Species.

- I. Upper lobe of caudal truncated posteriorly; lower edge of the fin with a distinct posterior notch.
- Origin of pectoral much nearer to end of snout than to origin of pelvics 1. *fabricii*.
- Origin of pectoral equidistant from end of snout and origin of pelvies 2. *nigrum*.
- II. Upper lobe of caudal produced and pointed posteriorly; lower edge of the fin without distinct posterior notch 3. *ornatum*.

1. *Centroscyllum fabricii*.

Spinax fabricii, Reinhardt, Dansk. Vid. Selsk. Fürh. iii. 1828, p. 16.

Centroscyllum fabricii, Müll. & Henle, Plagiost. p. 191 (1841); Duméril, Elasmobr. p. 449 (1865); Günth. Cat. Fish. viii. p. 425 (1870); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 11; Collett, Rep. Norweg. Fish. Inv. ii. no. 3, p. 25 (1905).

? *Centroscyllum granulosum*, Günth. 'Challenger' Deep-sea Fish. p. 7 (1880).

? *Centroscyllum ritteri*, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1908, p. 635, fig. 6.

Pectoral not quite reaching the vertical from the first dorsal spine, which is $\frac{1}{2}$ as long as the second.

Hab. Atlantic and North Pacific, in deep water.

In the British Museum two specimens of 720 and 750 mm. in total length from the North Atlantic. With these I have compared the type of *C. granulosum*, a specimen of 270 mm. from the Falklands, and it appears to me to belong to the same species. The description and figure of *C. ritteri* from Japan lead me to believe that this species also may be a synonym of *C. fabricii*, from which it is said to differ in the shorter pectoral fin and more slender caudal peduncle.

2. *Centroscyllium nigrum*.

Centroscyllium nigrum, Garman, Mem. Mus. Comp. Zool. xxiv. 1899, p. 28, pls. i., iv., & v.

Centroscyllium ruscosum, Gilbert, Bull. U.S. Fish. Comm. for 1903, p. 581, fig. 230 (1905).

Closely allied to *C. fabricii*, but the first dorsal spine is $\frac{2}{3}$ the length of the second, the pectoral extends to or beyond the vertical from the first dorsal spine and its origin is equidistant from the tip of snout and the origin of the pelvics.

Deep water of the Pacific (385 to 555 fath.). Off Tropical America (*Garman*); off Hawaii (*Gilbert*).

3. *Centroscyllium ornatum*.

Paracentroscyllium ornatum, Alcock, Ann. & Mag. Nat. Hist. (6) iv. 1889, p. 379.

Centroscyllium ornatum, Alcock, Journ. As. Soc. Bengal, lxxv. 1896, p. 308, and Cat. Ind. Deep-sea Fish. p. 14 (1898), and Ill. Zool. 'Investigator' Fishes, pl. viii. fig. 2, and pl. xxxv. fig. 1.

Very similar to *C. nigrum*, but the terminal part of the caudal fin is more produced and the lower edge has no distinct posterior notch.

Deep water of the Indian Ocean (285 to 690 fath.).

In the British Museum a specimen of 125 mm., one of the types of the species.

2. ECHINORHINUS.

Echinorhinus, Blainv. Bull. Soc. Philom. 1816, p. 121.

Goniodus, Agass. Poiss. Foss. iii. p. 183 (1836).

This genus resembles *Centroscyllium* and differs from other Squalidæ in the form of the mouth and structure of the dermal denticles. It differs from *Centroscyllium* in the dentition, each tooth having the middle cusp very strongly

developed and with the point deflected laterally, in the absence of fin-spines, and in the posterior position of the dorsal fins, the first above the pelvics.

A single species.

1. *Echinorhinus spinosus.*

Squalus spinosus, Gmelin, Linn. Syst. Nat. i. p. 1500 (1788).

Echinorhinus spinosus, Blainv. Bull. Soc. Philom. 1816, p. 121; Müll. & Henle, Plagiost. p. 96, pl. ix. (1841); Duméril, Elasmobr. p. 450 (1865); Günth. Cat. Fish. viii. p. 428 (1870); Parker, Trans. N. Z. Inst. xvi. 1884, p. 280; McCoy, Prodr. Zool. Viet. pl. cxliv. (1888); Jord. & Evermann, Bull. U.S. Nat. Mus. xlvii. 1896, p. 58.

Echinorhinus obesus, Smith, Ill. Zool. S. Afr., Fish. pl. i. (1838).

Hab. From the North Atlantic and the Mediterranean to South Africa, Australia, and New Zealand.

In the British Museum four specimens, the largest nearly 3000 mm. in total length.

3. OXYNOTUS.

Oxynotus, Rafin. Indic. Ittiol. Sicil. p. 45 (1810).

Centrina, Cuv. Règne Anim. ii. p. 130 (1817).

Body rather deep, trihedral; mouth rather narrow, transverse; upper teeth subconical, forming a group in front of the jaw; lower teeth erect, triangular, finely serrated; dorsal fins large, each with a spine.

A single species.

1. *Oxynotus centrina.*

Squalus centrina, Linn. Syst. Nat. i, ed. 10, p. 293 (1758), and ed. 12, p. 398 (1766).

Oxynotus centrina, Rafin. Indic. Ittiol. Sicil. p. 45 (1810); Duméril, Elasmobr. p. 444 (1865); Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 15, fig. 21.

Centrina salviani, Riso, Eur. Mérid. iii. p. 135 (1826); Müll. & Henle, Plagiost. p. 87 (1841); Günth. Cat. Fish. viii. p. 417 (1870).

Hab. Mediterranean and neighbouring parts of the Atlantic.

In the British Museum eight specimens, 220 to 720 mm. in total length.

Centrina brunniensis (Ogilby, Rec. Austral. Mus. ii. 1894 p. 62), from Tasmania, appears to be identical with *O. centrina*, from which it is said to differ in the larger fins. This is due, however, to the small size of the specimen described.

4 SPINAX.

Spinax, Cuv. Règne Anim. p. 129 (1817)
Acanthidium, Lowe, Proc. Zool. Soc. 1839, p. 91.

Seven species.

Synopsis of the Species.

I. Dermal denticles close-set, irregularly arranged.

A. Pelvic fins much nearer to caudal than to base of pectoral.

1. Each dermal denticle with one or more slender spines.

Length of head to pectoral fin nearly twice its greatest breadth 1. *niger*.

Length of head to pectoral fin $\frac{1}{2}$ its greatest breadth 2. *pessleri*.

2. Each dermal denticle with a small tubercle 3. *pusillus*.

B. Pelvic fins scarcely nearer to caudal than to base of pectoral.

4. *hillianus*.

II. Dermal denticles arranged in longitudinal series, at least on the tail.

A. Length of base of first dorsal (without the spine) not less than $\frac{1}{2}$ of the distance from the second.

Each dermal denticle with a rather stout spine 5. *princeps*.

Each dermal denticle with a rather slender spine 6. *granulosus*.

B. Length of base of first dorsal (without the spine) not more than $\frac{1}{4}$ of the distance from the second; dermal denticles forming undulating longitudinal series, except on the abdomen.

7. *lucifer*.

1. *Spinax niger*.

Squalus spinax, Linnaeus, Syst. Nat. ed. 10, p. 233 (1758), and ed. 12, p. 398 (1766).

? *Etmopterus aculeatus*, Rafin. Caratt. p. 14 (1810) *.

Spinax niger, Bonap. Faun. Ital., Pesc. (1835); Mull. & Henle, Plagiost. p. 86 (1841); Duméril, Elasmobr. p. 441 (1865); Gunth. Cat. Ich. viii, p. 424 (1870); Moreau, Poiss. de France, i. p. 348, fig. 59 (1881).

Etmopterus spinax, Carlos de Braganca, Res. Inv. 'Amelia,' ii. p. 61, pl. ii. fig. 1 (1904).

* *Hab.* Atlantic coasts of Europe; Mediterranean.

In the British Museum eighteen specimens, 170 to 430 mm. in total length, from depths ranging down to 365 fathoms.

2. *Spinax pessleri*.

Etmopterus pessleri, Lönnberg, Hamburg. Magelhaens. Sammlkreis., Fische, p. 5, fig. 1.

Hab. Magellan.

* Rafinesque's description and figure of *Etmopterus aculeatus* are evidently very inaccurate, but perhaps agree better with *Spinax niger* than with any other shark known from the Mediterranean; however, this is scarcely sufficient reason for using *Etmopterus* instead of *Spinax*.

3. *Spinax pusillus.*

Acanthidium pusillum, Lowe, Proc. Zool. Soc. 1839, p. 91.

Spinax pusillus, Günth. Cat. Fish. viii. p. 425 (1870); Vaill. 'Travailleur' et 'Talisman' Poiss. p. 72 (1888).

Etmopterus pusillus, Carlos de Braganca, Res. Inv. 'Amelia,' ii. p. 65, pl. ii. fig. 2 (1904).

Etmopterus frontimaculatus, Pietschmann, Anz. Ak. Wien, 1907, p. 395.

Hab. Mediterranean and neighbouring parts of the Atlantic; Japan.

In the British Museum fourteen specimens (including two from Misaki, Japan), 190 to 300 mm. in total length, from depths ranging down to 343 fathoms.

4. *Spinax hillianus.*

Spinax hillianus, Poey, Mem. Cuba, ii. p. 340 (1861).

Etmopterus pusillus, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 10, pl. ii. fig. 5.

Etmopterus spinax, Garman, Mem. Mus. Comp. Zool. xxvi. 1899, p. 27.

Hab. West Indies (Cuba; St. Christopher, 208 fathoms).

Goode and Bean's figure shows the pelvic fins nearly equidistant from the base of the pectoral and the lower caudal lobe; according to Garman the dermal denticles are spinate.

5. *Spinax princeps.*

Etmopterus princeps, Coll. Forh. Vid. Selsk. Christiania, 1904, no. 9, p. 8; and Rep. Norweg. Fish. ii. no. 3, p. 29, pl. i. figs. 1, 2 (1905).

Hab. Near the Faroe Islands, in deep water (750 to 1100 mètres).

Apparently closely allied to *S. granulosus*, but the dermal denticles with shorter and stronger spines.

6. *Spinax granulosus.*

Spinax granulosus, Günth. 'Challenger' Deep-sea Fish. p. 19, pl. ii. fig. C (1880).

Etmopterus villosus, Gilb. Bull. U.S. Fish. Comm. 1903, p. 580, pl. lxvi. (1905).

Pacific, in deep water (Chile, 120 fathoms; Hawaii, 222 to 498 fathoms).

In the British Museum the type, a specimen of 255 mm.

From the description and figure the type of *E. villosus* appears to differ only in features due to its smaller size (170 mm.), i. e. head a little longer, interspace between the dorsal fins a little shorter, &c. Similar differences may be seen in *S. niger*.

7. *Spinax lucifer*.

Etomopterus lucifer, Jord. & Snyder, Proc. U.S. Nat. Mus. xxv. 1902, p. 79; Jord. & Fowler, *ibid.* xxvi. 1903, p. 634, fig. 5.

Hab. Japan.

In the British Museum four specimens, 280 to 320 mm. in total length.

5. *SQUALUS*.

Squalus (part.), Linn. Syst. Nat. ed. 10, p. 233 (1758).

Squalus, Rafin. Caratt. p. 13 (1810).

Acanthorhinus, Blainv. Journ. Phys. 1816, p. 263.

Acanthias, Risso, Eur. Méríd. iii. p. 131 (1826).

Entorychirus, Gill, Proc. A.C. Philad. 1862, p. 496.

Eight species.

Synopsis of the Species.

I. Dorsal fin-spines without grooves or ridges; lower lobe of caudal fin without posterior notch; snout obtusely or acutely pointed. (*Squalus*.)

A. Nasal valves simple, triangular; back and sides with scattered rounded or oblong pale spots, which may disappear in large specimens.

1. Pectoral fin, when laid back, extending to the vertical from first dorsal spine, or a little beyond.

Praoral length of snout not greater than the distance from eye to first gill-opening 1. *fernandinus*.

Praoral length of snout greater than the distance from eye to first gill-opening 2. *acanthias*.

2. Pectoral fin, when laid back, extending to below the middle of first dorsal fin 3. *suckii*.

B. Nasal valves more or less distinctly bilobed; no spots on the body.

1. Free edge of pectoral fin straight or slightly emarginate, posterior angle not acutely pointed.

Pectoral fin, when laid back, extending to below the middle or posterior part of the base of the first dorsal fin 4. *mitsukurii*.

Pectoral fin, when laid back, extending to the vertical from the posterior end of base of first dorsal fin .. 5. *blainvillii*.

Pectoral fin, when laid back, extending well beyond the posterior end of base of first dorsal fin 6. *acutipinnis*.

2. Free edge of pectoral fin distinctly emarginate; posterior angle acutely pointed 7. *megalops*.

II. Each dorsal fin-spine with a prominent anterior ridge with a groove on each side of it; lower lobe of caudal fin with a posterior notch; snout rounded; posterior angle of pectoral fin considerably produced and acutely pointed. (*Entorychirus*) .. 8. *uyatus*.

1. *Squalus fernandinus.*

Squalus fernandinus, Molina, Hist. Chil. p. 393 (1788).

Acanthias vulgaris (part.), Günth. Cat. Fish. viii. p. 418 (1870).

Acanthias lebruni, Vaill. Miss. Sci. Cap Horn, Poiss. p. 13, pl. i. fig. 2 (1891).

Very closely allied to *S. acanthias*, but with a shorter snout, the praoral length equal to or less than the distance from eye to first gill-opening, the praocular length equal to the distance from anterior edge of eye to spiracle (more in *S. acanthias*, except in young examples). Dorsal fin-spines higher and spots on the body larger than in *S. acanthias*.

Hab. Southern Australia and Tasmania; New Zealand; Chile and Patagonia.

In the British Museum three specimens, 550 to 800 mm. in total length, from Tasmania, appear to belong to the species described and figured by Vaillant from Magellan. Records of *S. acanthias* from New Zealand doubtless refer to this species.

2. *Squalus acanthias.*

Squalus acanthias, Linn. Syst. Nat. i. ed. 10, p. 233 (1758), and ed. 12, p. 397 (1766); Jord. & Everm. Bull. U.S. Nat. Mus. xlvi. 1896, p. 54.

Spinax acanthias, Cuv. Règne Anim. ii. p. 180 (1817); Bonap. Faun. Ital., Pesc. fasc. 8 (1834).

Acanthias vulgaris, Risso, Eur. Mérid. iii. p. 131 (1820); Müll. & Henle, Plagiost. p. 83 (1841); Duméril, Elasmobr. p. 437 (1865); Günth. Cat. Fish. viii. p. 418 (1870).

Acanthias americanus, Storer, Mem. Amer. Ac. ii. 1846, p. 508.

Hab. Atlantic coasts of Europe and North America, southward to the Mediterranean and to Cuba.

In the British Museum twenty-one specimens, measuring up to 600 mm. in total length.

3. *Squalus sucklii.*

Spinax sucklii, Girard, Proc. Ac. Philad. 1854, p. 196.

Squalus sucklii, Jord. & Everm. Bull. U.S. Nat. Mus. xlvi. 1896, p. 54.

Pectoral fins conspicuously longer and dorsal fin-spines shorter than in *S. acanthias*.

Hab. Pacific coast of North America, southward to California.

In the British Museum two specimens, 700 and 860 mm. in total length.

4. *Squalus mitsukurii*.

Acanthias vulgaris (non Risso), Schleg. Faun. Japon., Poiss. p. 304, pl. cxlv. (1845).

Squalus mitsukurii, Jord. & Snyder. Proc. U.S. Nat. Mus. xxvi. 1903, p. 629, fig. 3; Gilb. Bull. U.S. Fish. Comm. 1903, p. 580 (1905).

Hab. China; Japan; Hawaii.

In the British Museum two specimens, 290 and 470 mm. in total length.

5. *Squalus blainvillii*.

Acanthias blainvillii, Risso, Eur. Mér. iii. p. 133, pl. iii. fig. 6 (1827); Müll. & Henle, Plagiost. p. 84 (1841); Duméril, Elasmobr. p. 438 (1865).

Spinax blainvillii, Bonap. Faun. Ital., Pesc. (1834).

Acanthias blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).

Hab. Mediterranean; Portugal.

In the British Museum five specimens, 230 to 540 mm. in total length.

6. *Squalus acutipinnis*.

Squalus blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).

Squalus acutipinnis, Regan, Ann. Natal Mus. ii. 1908, p. 248, pl. xxxvii.

Hab. South Africa; Mauritius.

In the British Museum four specimens, 190 to 560 mm. in total length, including the type of the species.

7. *Squalus megalops*.

Acanthias blainvillii (part.), Günth. Cat. Fish. viii. p. 419 (1870).

Acanthias megalops, Macleay, Proc. Linn. Soc. N. S. Wales, vi. 1881, p. 367.

Squalus megalops, Waite, Rec. Austral. Mus. iv. 1901, p. 33, pl. iv. fig. 2.

Hab. Southern Australia; Tasmania.

In the British Museum five specimens, 400 to 530 mm. in total length.

A stuffed specimen of 900 mm. from Juan Fernandez evidently represents the *Spinax fernandezianus* of Guichenot (Gay, Hist. Chile, Zool. ii. p. 365 (1848)); *Acanthias fernandezianus*, Philippi, An. Univ. Chile, lxxi. 1887, p. 559, pl. iv. fig. 3). This Chilian species may, perhaps, be different from *S. megalops*, but I am unable to give any distinctive characters. Ribeiro has described a *Squalus* from Rio Janeiro as *S. blainvillii* (Arch. Mus. Rio Janeiro, xiv. 1907, p. 168); this may be *S. fernandezianus*.

8. *Squalus uyatus.*

Squalus uyatus, Rafin. Caratt. p. 13, pl. xiv. fig. 2 (1810).

Spinax uyatus, Bonap. Faun. Ital., Pesc. (1834).

Acanthias uyatus, Müll. & Henle, Plagiost. p. 85 (1841); Duméril, Elasmobr. p. 439 (1865); Günth. Cat. Fish. viii. p. 419 (1870).

Hab. Mediterranean; Madeira.

In the British Museum two specimens, 330 and 340 mm. in total length.

This species is very distinct from others of the genus, but is a true *Squalus*, and cannot be placed in *Centrophorus*, as has been recently suggested by Garman (Bull. Mus. Comp. Zool. xlvi. 1906, p. 204).

6. *SCYMMODON.*

Scymnodon, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263.

Zameus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 633.

1. *Scymnodon ringens.*

Scymnodon ringens, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263, fig. 5.

Centrophorus ringens, Günth. Cat. Fish. viii. p. 423 (1870); Sim, Ann. Scot. N. H. 1902, p. 13.

Dermal denticles small, each with from two to four parallel keels. Präoral length of snout $\frac{2}{3}$ of the distance from eye to first gill-opening. Length of base of first dorsal (without the spine) about $\frac{1}{2}$ of the distance from the second.

Hab. Atlantic coasts of Europe, in deep water.

In the British Museum two specimens, 900 and 1000 mm. in total length. *

2. *Scymnodon squamulosus.*

Centrophorus squamulosus, Günth. 'Challenger' Deep-sea Fishes, p. 5, pl. ii. fig. 13 (1887).

Zameus squamulosus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 633.

Dermal denticles very small, each with a strong median keel and sometimes a pair of short lateral keels. Präoral length of snout $\frac{2}{3}$ the distance from eye to first gill-opening. Length of base of first dorsal (without the spine) less than $\frac{1}{2}$ the distance from the second.

Hab. Japan, in deep water.

In the British Museum one specimen, type of the species, 650 mm. in total length.

7. CENTROSCYMNUS.

Centroscymnus, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263.

Synopsis of the Species.

- I. Anterior labial grooves moderate, each about as long as its distance from the middle of the upper jaw ; nostrils oblique.
 Dorsal spines well developed and strongly projecting. 1. *macracanthus*.
 Dorsal spines short, slightly projecting ; dermal denticles not carinate 2. *cælolepis*.
 Dorsal spines scarcely projecting ; dermal denticles on head and on anterior part of body, except the sides, pluricarinato 3. *owstoni*.
 Dorsal spines not projecting, hidden beneath the skin ; dermal denticles on head and on anterior part of body, except the sides, tricarinato 4. *cryptacanthus*.
- II. Anterior labial grooves long, each about twice as long as its distance from the middle of the upper jaw ; nostrils slightly oblique. 5. *obscurus*.
- III. Anterior labial grooves very long, separated by a narrow interspace ; nostrils transverse 6. *crepidater*.

1. *Centroscymnus macracanthus*.

Centroscymnus macracanthus, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 436.

Hab. Magellan.

In the British Museum one specimen, 640 mm. in total length, type of the species.

2. *Centroscymnus cælolepis*.

Centroscymnus cælolepis, Bocage & Capello, Proc. Zool. Soc. 1864, p. 263, fig. 4 ; Vaill. 'Travailleur' et 'Talisman' Poiss. p. 63, pl. ii. fig. 1 (1888).

Hab. North Atlantic, in deep water.

In the British Museum five specimens, 250 to 1000 mm. in total length.

3. *Centroscymnus owstoni*.

Centroscymnus owstonii, Garman, Bull. Mus. Comp. Zool. xlvi. 1906, p. 207.

Hab. Japan.

4. *Centroscymnus cryptacanthus*.

Centrophorus cælolepis (non Bocage & Capello), Günth. Cat. Fish. viii, p. 428 (1870).

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Centroscymnus ocellatus, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 11, pl. iv, fig. 13 (1896).

Centroscymnus cryptacanthus, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 437.

Hab. Madeira.

In the British Museum one specimen, 700 mm. in total length, type of the species.

5. *Centroscymnus obscurus*.

Centroscymnus obscurus, Vaill. 'Travailleur' et 'Talisman' Poiss. p. 67, pl. ii, fig. 2 (1888).

Hab. Coast of Soudan, 1400 to 1435 metres.

6. *Centroscymnus crepidater*.

Centrophorus crepidater, Boege & Capello, Proc. Zool. Soc. 1864, p. 262, fig. 3; Gunth. Cat. Fish. viii. p. 421 (1870).

Centrophorus rossi, Alcock, Ann. & Mag. Nat. Hist. (7) ii. 1898, p. 143, and Ill. Zool. 'Investigator,' Fishes, pl. xxvi, fig. 3 (1899).

Hab. Atlantic and Indian Oceans.

In the British Museum one specimen, 750 mm. in total length.

8. CENTROPHORUS.

Centrophorus, Mull. & Henle, Plagiost. p. 88 (1838).

Lepidorhinus, Bouap. Nuov. Ann. Sci. Bologna, ii. 1838, p. 207.

Machecephalus, Johnson, Proc. Zool. Soc. 1867, p. 713.

Deania, Jord. & Snyder, Proc. U.S. Nat. Mus. xxv. 1902, p. 80.

Thirteen species, all found at considerable depths.

Synopsis of the Species.

I. Posterior angle of pectoral fin not or but slightly produced.

A. Eye equidistant from end of snout and last gill-opening; dermal denticles tricuspid.

1. Dorsal fins subequal or the second the shorter.

Pectoral, when laid back, extending $\frac{1}{2}$ the distance from its base to the vertical from first dorsal spine 1. *hystrioosus*.

Pectoral, when laid back, extending more than $\frac{1}{2}$ the distance from its base to the vertical from first dorsal spine 2. *calteneus*.

2. Second dorsal a little longer than the first. 3. *rostratus*.

B. Eye nearer to end of snout than to last gill-opening.

1. Dermal denticles leaf-shaped, with serrated edges, each with a strong median keel and sometimes a weaker keel at each lateral edge. *

Length of base of second dorsal (without the spine)
 $\frac{1}{2}$ that of the first (without the spine), which is
 $\frac{1}{2}$ the interspace between the two 4. *dumerili*.

Length of base of second dorsal (without the spine)
 1. $\frac{1}{2}$ that of the first (without the spine), which is
 4 to $\frac{1}{2}$ the interspace between the two 5. *aquamosus*.
 2. Dermal denticles tricuspid and tricarinate; second dorsal a little shorter than the first.
 Length of base of first dorsal (without the spine) 2½ to 3 in the distance from the second; length of snout (in front of the eye) 8½ in the length of head (to first gill-opening) 6. *foliaceus*.
 Length of base of first dorsal (without the spine) 2 to 2½ in the distance from the second; length of snout (in front of the eye) 2½ to 2¾ in the length of head (to first gill-opening) 7. *steindachneri*.
 3. Dermal denticles pluricarinate 8. *acus*.

II. Posterior angle of pectoral fin considerably produced and acutely pointed.

A. Distance from mouth to nostrils 1½ that from nostrils to end of snout.

1. Spine of second dorsal $\frac{1}{2}$ to $\frac{1}{3}$ exposed.
 Length of base of second dorsal (without the spine) $\frac{1}{2}$ that of the first (without the spine), which is $\frac{1}{2}$ the interspace between the two 9. *insitanicus*.
 Length of base of second dorsal (without the spine) $\frac{1}{2}$ that of the first (without the spine), which is $\frac{1}{2}$ to $\frac{1}{3}$ the interspace between the two 10. *granulosus*.
 Length of base of second dorsal (without the spine) $\frac{1}{2}$ that of the first (without the spine), which is $\frac{1}{2}$ the interspace between the two 11. *braganceae*.
 2. Spine of second dorsal $\frac{1}{3}$ exposed; length of base of first dorsal (? without the spine) $\frac{2}{3}$ the distance from the second. 12. *tessellatus*.
 B. Distance from mouth to nostrils more than twice that from nostrils to end of snout; length of base of first dorsal (without the spine) $\frac{1}{2}$ the distance from the second 13. *moluccensis*.

1. *Centrophorus hystricosus*.

Acanthidium hystricosum, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 206.

Hab. Japan.

2. *Centrophorus calcus*.

Acanthidium calceum, Lowe, Proc. Zool. Soc. 1839, p. 92.

Centrophorus calcus, Günth. Cat. Fish. viii. p. 428 (1870); Vaill. 'Travailleur' et 'Talisman' Poiss. p. 71, pl. iii. fig. 1 (1888); Collett, Rep. Norweg. Fish. ii. p. 21 (1905).

Centrophorus crepidulus, Bocage & Capello, Proc. Zool. Soc. 1864, p. 202, fig. 2.

Deania elegans, Jord. & Snyder, Proc. U.S. Nat. Mus. xxv. 1902, p. 80; Jord. & Fowler, ibid. xxvi. 1903, p. 682, fig.

? *Acanthidium aenatum*, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 207.

Hab. Atlantic coasts of Europe; Japan.

In the British Museum eleven specimens, measuring up to 950 mm. in total length.

The species is very variable, and the fins are larger in the young than in the adult. In three specimens from Portugal of about 260 mm. the base of the second dorsal (without the spine) varies from $\frac{3}{4}$ to $\frac{7}{8}$ of that of the first dorsal (without the spine), which is contained from less than $1\frac{2}{3}$ to more than $1\frac{5}{6}$ times in the distance between the dorsals. I am unable to separate specifically from these a Japanese specimen of 380 mm. received as *Deania eglantina*. In adult specimens the base of the first dorsal (without the spine) is about $\frac{1}{2}$ the interspace between the dorsals.

3. *Centrophorus rostratus.*

Acanthidium rostratum, Gurn. Bull. Mus. Comp. Zool. xlvi. 1906, p. 206.

Hab. Japan.

4. *Centrophorus dumerili.*

Machecephalus dumerili, Johnson, Proc. Zool. Soc. 1867, p. 713.

Centrophorus dumerili, Günth. Cat. Fish. viii. p. 422 (1870).

Centrophorus squamosus, Vaill. 'Travailleur' et 'Talisman' Poiss. p. 69, pl. iii. fig. 2 (1888).

Hab. Madeira.

In the British Museum one specimen, 1000 mm. in total length, type of the species.

I am unable to recognize any character in dentition or in structure of the dermal denticles by which this species may be distinguished from *C. squamosus*. I cannot therefore accept Vaillant's opinion, based on examination of a head in the Paris Museum, which appears to be part of the type specimen of *C. squamosus*, that this species rather than the next is the true *Centrophorus squamosus*.

5. *Centrophorus squamosus.*

Squalus squamosus, Gmelin, Linn. Syst. Nat. p. 1502 (1788).

Centrophorus squamosus, Müll. & Henle, Plagiost. p. 90, pl. xxxiv. (1838); Duméril, Elasmobr. p. 448 (1865); Günth. Cat. Fish. viii. p. 422 (1870); Holt & Calderwood, Trans. R. Dublin Soc. (2) v. 1805, p. 378, pl. xiii. fig. 1; Jensen, Vidd. Medd. 1890, p. 411, pl. iii.; Collett, Rep. Norweg. Fish. ii. p. 19 (1905).

Hab. North Atlantic and Mediterranean.

In the British Museum three specimens, 1120 to 1350 mm. in total length.

6. *Centrophorus foliaceus.*

Centrophorus foliaceus, Günth. 'Challenger' Deep-sea Fish. p. 5, pl. ii. fig. A.

Hab. Japan.

In the British Museum two specimens, 355 and 415 mm. in total length, including the type of the species.

7. *Centrophorus steindachneri.*

Centrophorus steindachneri, Pietschmann, Anz. Ak. Wien, 1907, p. 394.

Hab. Japan.

8. *Centrophorus acus.*

Centrophorus acus, Garm. Bull. Mus. Comp. Zool. xlvi. 1906, p. 204.

Hab. Japan.

This species appears to be very similar to *C. granulosus*, differing in having the inner angles of the pectorals only slightly produced.

9. *Centrophorus lusitanicus.*

Centrophorus lusitanicus, Bocage & Capello, Proc. Zool. Soc. 1884, p. 260, fig. 1; Günth. Cat. Fish. viii. p. 421 (1870).

Hab. Coast of Portugal.

In the British Museum one specimen, 750 mm. in total length.

10. *Centrophorus granulosus.*

Squalus granulosus, Schneid. Bloch's Syst. Ichth. p. 135 (1801).

Centrophorus granulosus, Müll. & Henle, Plagiost. p. 89, pl. xxxiii. (1841); Dumeril, Elasmobr. p. 447 (1865); Günth. Cat. Fish. viii. p. 420 (1870).

Hab. Mediterranean and neighbouring parts of the Atlantic.

In the British Museum four specimens, 430 to 1050 mm. in total length.

11. *Centrophorus bragancae.*

Centrophorus bragancae, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 438.

Hab. Coast of Portugal.

In the British Museum two specimens, 440 and 460 mm. in total length, types of the species.

12. *Centrophorus tessellatus.*

Centrophorus tessellatus, Garm. Bull. Mus. Comp. Zool. xlvi. 1903, p. 205.

Hab. Japan.

13. *Centrophorus moluccensis.*

Centrophorus moluccensis, Bleek. Act. Soc. Sc. Indo-Néerl. viii., Amboyna, p. 3; Günth. Cat. Fish. viii. p. 421 (1870).

Hab. Amboyna.

In the British Museum one specimen, 210 mm. in total length, type of the species.

9. SCYMNORHINUS.

Scymnorhinus, Bonap. Cat. Pesc. Europ. p. 16 (1836).

*Dalatias**, Gray, Chondropt. p. 75 (1851).

This genus differs from *Scymnodon* in the absence of fin-spines and in having the lower teeth finely serrated.

A single species.

Scymnorhinus lichia.

Squalus licha, Bonnaterre, Encycl. Ichth. p. 12 (1788).

Scymnus lichia, Cuv. Règne Anim. ed. 1, p. 130 (1817); Müll. & Henle, Plagiost. p. 92 (1841); Duméril, Elasmobr. p. 452 (1866); Günth. Cat. Fish. viii. p. 425 (1870).

Dalatias lichia, Gray, Chondropt. p. 75 (1851); Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1908, p. 687.

Hab. Mediterranean and neighbouring parts of the Atlantic; Japan.

In the British Museum nine specimens, 320 to 1280 mm. in total length, including one from Japan.

10. SOMNIOSUS.

Somniosus, Le Sueur, Journ. Ac. Philad. 1818, p. 222.

Læmargas, Müll. & Henle, Plagiost. p. 93 (1838).

Two species.

1. *Somniosus microcephalus.*

Squalus microcephalus, Schneider, Blech's Syst. Ichth. p. 136 (1801).

Squalus borealis, Scoresby, Arct. Reg. i. p. 538, pl. xv. figs. 3 & 4 (1820).

* *Dalatias sparophagus*, described and figured by Rafinesque, was probably either *Scymnorhinus lichia* or *Somniosus rostratus*. *Dalatias*, like *Etmopterus*, may be regarded as a *nomen nudum*.

Læmargus borealis, Müll. & Henle, Plagiost. p. 93 (1841); Duméril, Elasmobr. p. 455, pl. v. figs. 1 & 2 (1865); Günth. Cat. Fish. viii. p. 426 (1870).

Somniosus microcephalus, Jord. & Evermann, Bull. U.S. Nat. Mus. xlvi. 1896, p. 57; Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1908, p. 638.

First dorsal equidistant from the bases of the pectoral and pelvic fins.

Hab. Arctic seas, southward to Japan, Oregon, Cape Cod, and France.

In the British Museum three specimens, 1800 to 4500 mm. in total length.

2. *Somniosus rostratus*.

Scymnus rostratus, Risso, Eur. Mérid. iii. p. 138, fig. 7 (1826).

Læmargus rostratus, Canestrini, Mem. Accad. Sc. Torin. xxi. 1865, p. 364, pl. ii. fig.; Günth. Cat. Fish. viii. p. 427 (1870); Helbing, Nov. Act. Acad. Germ. lxxxi. 1904, p. 335.

First dorsal nearer to the base of the pectoral than to that of the pelvic fins; body more elongate than in *S. microcephalus*.

Hab. Mediterranean.

In the British Museum one specimen, 800 mm. in total length.

* 11. *ISISTIUS*.

Isistius, Gill, Proc. Ac. Philad. 1864, p. 264.

A single species.

1. *Isistius brasiliensis*.

Scymnus brasiliensis, Quoy & Gaim. Voy. 'Uranie,' Zool. p. 198 (1824); Müll. & Henle, Plagiost. p. 92 (1841); Duméril, Elasmobr. p. 453 (1865).

Isistius brasiliensis, Gill, Proc. Ac. Philad. 1864, p. 264; Günth. Cat. Fish. viii. p. 429 (1870); Garm. Mem. Mus. Comp. Zool. xxiv. 1899, p. 34, pl. i. fig. 1.

Loius feror, Kner, Denkschr. Ak. Wien, xxiv. 1835, p. 10, pl. iv. fig. 2.

Hab. Tropical and subtropical seas.

In the British Museum four specimens, 150 to 230 mm. in total length.

12. *EUPROTOMICRUS*.

Euprotomicrus, Gill, Proc. Ac. Philad. 1864, p. 264.

A single species.

1. *Euprotomicrus bispinatus.*

Scymnus bispinatus, Quoy & Gaim. Voy. 'Uranie,' Zool. p. 197, pl. xliv. figs. 1 & 2 (1824).

Scymnus (Læmargus) labordii, Müll. & Henle, Plagiost. p. 94 (1841).

Læmargus labordii, Duméril, Elasmobr. p. 457 (1865).

Euprotomicrus labordii, Günth. Cat. Fish. viii. p. 428 (1870); Cunningham, Proc. Zool. Soc. 1899, p. 732.

Euprotomicrus hyalinus, Eigenmann. Proc. Cal. Ac. (2) iii. 1890, p. 35.

Hab. Indo-Pacific.

In the British Museum three specimens, 200 to 220 mm. in total length.

13. PRISTIOPHORUS.

Pristiophorus, Müll. & Henle, Plagiost. p. 97 (1841).

The form of the rostrum and the arrangement of the rostral teeth change considerably during growth. In the young the snout is relatively much shorter and broader than in the adult and is armed with movable teeth ; those of the lateral series are of equal size and correspond to the principal teeth of the adult, the smaller intermediate teeth not having been developed. The barbels are proportionately longer and are inserted more posteriorly in young specimens.

Three species.

Synopsis of the Species.

I. Barbel a little nearer to tip of snout than to nostril (in the adult), or a little nearer the nostril (in the young)..... 1. *cirratus*.

II. Barbel much nearer to nostril than to tip of snout.

Breadth of snout at its base $3\frac{1}{2}$ in its length (in a specimen of 1000 mm.); barbel, when laid back, reaching nostril (adult) or mouth (young)

2. *nudipinnis*.

Breadth of snout $3\frac{1}{2}$ in its length (in a specimen of 700 mm.); barbel, when laid back, not reaching nostril

3. *japonicus*.

1. *Pristiophorus cirratus.*

Pristis serratus, Latham, Trans. Linn. Soc. ii. 1794, p. 281, pl. xxvi.

Pristiophorus serratus, Müll. & Henle, Plagiost. p. 98 (1841); Duméril, Elasmobr. p. 461 (1865); Günth. Cat. Fish. viii. p. 432 (1870); Jaekel, Arch. f. Nat. 1891, p. 45.

Hab. New South Wales, Victoria, and Tasmania.

In the British Museum six specimens, 300 to 1200 mm. in total length.

2. *Pristiophorus nudipinnis.*

Pristiophorus nudipinnis, Günth. Cat. Fish. viii. p. 432 (1870); McCoy, Prodr. Zool. Vict. vi. 1881, p. 24, pl. lvi. fig. 2.
Pristiophorus owenii, Günth. l. c.

Hab. Victoria and Tasmania.

In the British Museum two specimens, types of the species and of *P. owenii* respectively, 1000 and 330 mm. in total length.

3. *Pristiophorus japonicus.*

Pristiophorus cirratus (non Latham), Schleg. Faun. Japon., Poiss. p. 305, pl. cxxxvii. (1850).
Pristiophorus japonicus, Günth. Cat. Fish. viii. p. 483 (1870); Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 639.

Hab. Japan.

In the British Museum two specimens, 600 and 700 mm. in total length, including the type of the species.

14. PLIOTREMA.

Pliotrema, Regan, Ann. Natal Mus. i. 1906, p. 1.

A single species.

1. *Pliotrema warreni.*

Pliotrema warreni, Regan, Ann. Natal Mus. i. 1906, p. 1, pl. i.

Hab. South Africa.

In the British Museum two specimens, 730 and 810 mm. in total length, including the type of the species.

VIII.—*Rhynchotal Notes*.—XLIV. (*concluded from vol. i. p. 531*). By W. L. DISTANT.

HOMOPTERA.

Fam. Jassidae.

Subfam. TETTIGONIELLINE.

Genus PROPETES.

Propetes, Walk. List Hom. iii. p. 797 (1851).

Type, *P. compressa*, Walk.

"Head large, conical, with a longitudinal furrow, not pointed: abdomen compressed towards the base: fore shanks widening towards the tips" (Walker).

Vertex about as long as breadth between eyes, somewhat flattened and anteriorly deflected, apical margin broad and truncate, centrally longitudinally sulcate for its entire length; face broad, centrally flattened and slightly foveately depressed, the margins shortly, strongly, transversely carinate; pronotum quadrangular, as long as broad at base, slightly narrowed before the posterior angle, the lateral margins almost straight; scutellum considerably longer than broad, posteriorly acuminate, transversely impressed before apical area, which is gibbous, cordate, the extreme apex slender; tegmina narrow, subhyaline, the costal margin concavely sinuate before apical area, a transverse discal vein at about one third from base, four apical cells, three ante-apical cells (on one tegmen of the type the middle ante-apical cell possesses three transverse veins, in the other tegmen these are absent); anterior tibiæ somewhat broadly compressed and foliaceous, sulcate above; abdomen compressed towards the base.

Allied to *Lissoscarta*, Stål, from which it differs by the longer and sulcated vertex, the flattened (not convex) face, the much more dilated anterior tibiæ, &c.

Propetes compressa.

Propetes compressa, Walk. List Hom. iii. p. 797 (1851).

Tettigonia compressa, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 616, pl. xxi. fig. 9 (1855).

Hab. Amazonas.

Genus DIEDROCEPHALA.

Diedrocephala, Spin. Mem. Mat. Fis. Soc. Ital. Sci. xxv. p. 97. n. 332 (1852); Stål, Mem. Fabr. ii. p. 78 (1869); Ball, Proc. Iowa Acad. Sci. viii. p. 63 (1901).

Type, *D. variegata*, Fabr.

Stål (*supra*) has clearly defined this genus from the salient characters of the type—"Capite sulco instructo; tegminibus apice truncatis vel sinuato-truncatis."

Diedrocephala ignifer.

Coccus ignifer, Walk. List Hom. iii. p. 804 (1851).

Vertex much longer than breadth between the eyes, the lateral margins oblique, very slightly sinuate, narrowed to apex, which is truncately rounded, strongly centrally longitudinally sulcate.

Hab. Colombia.

Diedrocephala cleora, sp. n.

Vertex and pronotum black; pronotum with a large white spot, the posterior half of which is a little wider and more or less convex behind, this spot commences on anterior margin, reaching or passing the middle of disk; scutellum white, a large triangular spot at each basal angle, narrowly connected on basal margin, black; body beneath and legs greyish white; tegmina purplish, a large semicircular spot on middle of claval suture, a rounded spot near claval apex, and the costal area much more or less angularly widened interiorly, white, apex black, preceded and margined with a transverse ochraceous spot; vertex flat, about as long as breadth between eyes, subangularly anteriorly produced, centrally, obscurely, longitudinally, linearly sulcate, the margins distinctly reflexed; face with the disk longitudinally flattened, the lateral areas transversely ridged; scutellum transversely impressed near middle.

Long., incl. tegm., 9½–10½ mm.

Hab. Ecuador; Cachabé (Rosenberg, Brit. Mus.).

Allied to *D. flavoguttata*, Latr.

Diedrocephala estella, sp. n.

Vertex, pronotum, and scutellum black; vertex with narrow lateral and apical margins and a central linear spot at apex ochraceous; lateral margins of pronotum very narrowly and obscurely paler; head beneath, sternum, and legs pale ochraceous; apices of the tarsi black; abdomen beneath dark ochraceous, the connexivum testaceous; tegmina purplish black, the apical area sanguineous, with its posterior margin black, and a small pale ochraceous costal spot at its inner margin; inner claval margin narrowly paler or castaneous.

Var.—Body beneath paler and more greyish; apical area of tegmina pale brownish ochraceous, not sanguineous.

Vertex broad, about as long as breadth between eyes, subconically rounded anteriorly, centrally longitudinally sulcate; face centrally longitudinally flattened, the lateral areas transversely striate; pronotum very finely transversely wrinkled in some specimens on its anterior area, a short pale longitudinal line; apices of tegmina subtruncately rounded.

Long., incl. tegm., 9 mm.

Hab. Ecuador; Cachabé (Rosenberg, Brit. Mus.).

Allied to *D. notanda*, Fowl., but with the vertex more rounded and much less angulate anteriorly; colour-markings of the tegmina different.

Diedrocephala zea, sp. n.

Vertex, pronotum, and scutellum black; basal two-thirds of pronotum pale stramineous; head beneath, sternum, and legs pale stramineous; face (excluding a spot before clypeus) black; anterior and intermediate tibiæ and the apices of the tarsi black; abdomen mutilated in typical specimen; tegmina black, with two broad, transverse, very pale stramineous fasciæ, one before and the other beyond middle; vertex a little longer than breadth between eyes, the disk concave, centrally longitudinally linearly sulcate, subangularly rounded anteriorly; face centrally broadly flattened, the lateral areas transversely striate; pronotum very finely transversely wrinkled.

Long., incl. tegm., 14 mm.

Hab. Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

In structure allied to *D. præstantior*, Fowl.

Diedrocephala mitra, sp. n.

Vertex, pronotum, and scutellum stramineous; lateral margins of vertex, ocelli, anterior, posterior, and lateral margins of pronotum, and apex of scutellum castaneous or picaceous brown; head beneath, sternum, and legs ochraceous; abdomen beneath reddish ochraceous; base and lateral margins of face black; apices of first and second joints of posterior tarsi reddish; tegmina castaneous, with three large stramineous spots, the first elongate in basal area of clavus, sometimes apically enlarged inwardly, the second subsemicircular near apex of clavus, extending from claval suture to about middle of tegmen, the third smaller, paler, and more or less angulate in apical area; vertex long and angularly produced, its margins oblique, its apex truncately rounded, much longer than breadth between eyes, finely, centrally, longitudinally, linearly sulcate; the lateral margins reflexed, the apex subspatulate; face broadly centrally flattened, the lateral areas transversely striate; pronotum finely transversely wrinkled; scutellum finely transversely impressed before apical area.

Long., incl. tegm., 12 mm.

Hab. Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

Genus DRÆCULACEPHALA.

Dræculacephala, Ball, Proc. Iowa Acad. Sci. viii, p. 66 (1901).

Type, *D. mollipes*, Say.

Dræculacephala mollipes.

Tettigonia mollipes, Say, Journ. Acad. Nat. Sci. Phil. vi. p. 312 (1831); Fowl. (part.) Biol. Centr.-Am., Rhynch. Hom. ii. p. 273, t. xviii. fig. 15 (1900).

Diedrocephala mollipes, Van Duz. Trans. Am. Ent. Soc. xxi. p. 278 (1894).

Dræculacephala mollipes, Proc. Iowa Acad. Sci. viii. p. 67, t. vii. fig. 1 (1901).

Tettigonia antica, Walk. List Hom. iii. p. 771 (1851).

Tettigonia minor, Walk. loc. cit. p. 772; Van Duz. Ent. News, v. p. 156 (1894).

Tettigonia producta, Walk. loc. cit.; Van Duz. loc. cit.

Tettigonia acuta, Walk. loc. cit. p. 773; Van Duz. loc. cit.

Fowler, in following Signoret, has included *T. innotata*, Walk., with the above species. The unique type of *T. innotata*, however, is now headless, and therefore of questionable identity.

Dræculacephala septemguttata.

Tettigonia 7-guttata, Walk. List Hom. iii. p. 773 (1851); Sign. Ann. Soc. Ent. Fr. (3) ii. p. 727, t. xxi. fig. 15 (1854).

Diedrocephala septemguttata, Walk. List Hom., Suppl. p. 233 (1858); Van Duz. Ent. News, v. p. 156 (1894); id. Trans. Am. Ent. Soc. xxi. p. 280 (1894).

Dræculacephala mollipes, var. 7-guttata, Ball, Proc. Iowa Acad. Sci. viii. p. 68 (1901).

Dræculacephala angulifera.

Tettigonia angulifera, Walk. List Hom. iii. p. 771 (1851); Sign. (part.) Ann. Soc. Ent. Fr. (3) ii. p. 727, t. xxi. fig. 14 (1854).

Diedrocephala angulifera, Van Duz. Ent. News, v. p. 156 (1894); id. Trans. Am. Ent. Soc. xxi. p. 279 (1894).

Tettigonia mollipes (part.), Fowl. Biol. Centr.-Am., Rhynch. ii. p. 273 (1900).

Dræculacephala angulifera, Ball, Proc. Iowa Acad. Sci. viii. p. 69, t. vii. fig. 4 (1901).

Signoret included the *T. antica*, Walk., as a synonym of this species instead of *D. mollipes*, Say, and Fowler treated *angulifera* as = *mollipes*.

Genus HELOCHARA.

Melochara, Fitch, Hom. N.Y. State Cab. p. 56 (1851); Ball, Proc. Iow. Acad. Sci. viii. p. 62 (1901).

Type, *H. communis*, Fitch.

Helochara communis.

Helochara communis, Fitch, Hom. N.Y. State Cab. p. 56 (1851); Van Duz. (part.) Trans. Am. Ent. Soc. xxi. p. 280 (1894); Ball (part.), Proc. Iowa Acad. Sci. viii. p. 62, t. vi, fig. 1 (1901).

Tettigonia similis, Walk. List Hom. iii. p. 769 (1851).

The type of *T. similis*, Walk., conclusively proves that it is a synonym of *H. communis*, Fitch, while the type of *T. herbida*, Walk., equally shows that it has no affinity with this species. Signoret was perfectly correct in his identification of these species. Walker mixed up the unlocalized type of his *T. herbida* with specimens of his following species, *T. similis*=*H. communis*, while his descriptions are faulty, he apparently having confused his descriptions as well as his specimens. The types, however, settle the question, as they did when Signoret long ago examined them (*cf.* remarks under *Kolla herbida*, 'Annals,' 1908, vol. i. p. 530).

Under the name *T. mollipes* there is a specimen of *H. communis* collected at Ventanas, Mexico, by Forrer.

Genus ONCOMETOPIA.

Oncometopia, Stål, Hem. Fabr. ii. p. 60 (1869).

Proconia, Amy, & Serv. Hist. Néér. p. 571 (1843), nec Lep. & Serv.

Type, *O. undata*, Fabr.

Oncometopia fuscipennis.

Oncometopia fuscipennis, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 230, t. xiv, fig. 16 (1899).

Oncometopia aspernea, Bredd., MS.

Fowler's figure, as compared with his type, is unsatisfactory; the colour of the tegmina and the margins of the abdomen are altogether misleading, as can be seen by a comparison with his description. Breddin's specimens are from Ecuador.

Oncometopia batesi, sp. n.

Vertex castaneous, with an oblique ochraceous ovate spot on each side of the apical margin (these spots are connected and concolorous with the face beneath); pronotum ochraceous, anterior margin (broadly) and posterior margin (narrowly) castaneous, the first sinuate behind; scutellum castaneous, with a discal piceous quadrate spot and a small obscure spot of the same colour near each basal angle, apical area ochraceous; abdomen above black, the lateral margins

and apex ochraceous; face, body beneath, and legs ochraceous; tegmina with about basal half purplish brown, here and there tinged with violaceous, apical half extending inwardly and occupying apex of clavus pale yellowish white, a cretaceous white spot (inconstant) on costal margin near apex of the darker coloration; vertex deflected, as long as breadth between eyes, broadly rounded anteriorly; face broad, centrally, longitudinally, smoothly subdepressed, the lateral areas transversely striate; anterior tibiæ sulcate; pronotum (excluding anterior marginal area) finely rugulose and coarsely punctate.

Long., excl. tegm., ♀ 18 mm.; exp. tegm. 26 mm.

Hab. Amazons (Bates, Brit. Mus.).

Oncometopia insignis, sp. n.

Vertex, pronotum, and scutellum lilacinous; a small transverse central spot near apex of vertex, the margins of the ocelli, narrow anterior and posterior margins of pronotum and two oblique spots on its anterior area proceeding from behind the eyes, and anterior margin (angulated posteriorly) and apex of scutellum, black; abdomen above black, large marginal spots, apical segmental margin and anal appendage lilacinous; body beneath black; more than basal halves of face and cheeks, lateral areas of sternum, large lateral marginal spots to abdomen, posterior segmental margins, and a large spot on each side of apical segment, lilacinous; legs lilacinous, bases of femora, apices of tibiæ, and the tarsi more or less piceous; tegmina lilacinous, minutely spotted with greyish, apex (posteriorly widened inwardly to apex of clavus) very pale ochraceous, preceded by a transverse fuscous fascia not extending through the lower apical cell; wings hyaline, the veins, apex, and posterior margin fuscous; vertex as long as breadth between eyes, broadly rounded in front, a very short central incised line at base; face centrally broadly longitudinally subdepressed and reticulately wrinkled, the lateral areas transversely striate, anterior tibiæ sulcate; pronotum (excluding anterior marginal area) transversely wrinkled, on anterior area two small central foveate depressions.

Long., excl. tegm., ♀ 12 mm.; exp. tegm. 21 mm.

Hab. Rio Grande do Sul (Ihering, Brit. Mus.).

To be placed near *O. personata*, Sign.

Oncometopia hamleti, sp. n.

Vertex ochraceous, with irregular black linear markings

which enclose six ochraceous spots—two quadrate and central, one large and irregular before each eye, and one smaller on each side of apical margin; eyes black, with ochraceous basal margins; pronotum ochraceous, an oblique spot on each lateral area, and an angulate spot behind each eye, three spots in transverse series near middle, a central spot at base, and very narrow basal margin black, some irregular linear purplish markings on disk and near margins; scutellum ochraceous, with black markings enclosing two central spots and one near each basal angle; abdomen above piceous brown, margins of the segments black, lateral marginal spots and the anal appendage pale ochraceous; face, body beneath, and legs ochraceous; face with black markings enclosing a basal roundish spot; apex of clypeus, central spot to sternum, abdominal segmental markings, and apices of tibiæ and tarsi black; tegmina pale yellowish grey, somewhat closely covered with small purplish circular rings, a black spot on disk before middle, another near apex of clavus, and a third nearly crossing tegmina at about one-third from apex, these black spots are largely broken up by paler ones, apical area posteriorly extending to apex of clavus pale ochraceous, with a posterior and a marginal fuscous spot, and preceded by a short central black line; wings pale fuliginous, the veins darker, the disk more or less hyaline; vertex about as long as breadth between eyes, broadly rounded in front; face broadly, centrally, longitudinally smooth, the lateral areas transversely striate; anterior tibiæ sulcate; pronotum somewhat foveately depressed on each lateral area.

Var.—Tegmina with the ground-colour pale carmine-red, not yellowish grey, but with the markings similar.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 25 mm.

Hab. Brazil; Constancia and Tejuca (*Hamlet Clark*, Brit. Mus.); Therscopolis (Brit. Mus.); Larges (Coll. Dist.).

Oncometopia venosula, sp. n.

Oncometopia venosula, Bredd., MS.

Body black or piceous black; an elongate spot on the lateral margins of scutellum, lateral margins of the abdomen above, and abdomen beneath (excluding apex) brownish ochraceous; tegmina dark purplish black to the commencement of the anteaapical cells, remaining area and apex of clavus palely infuscate, the veins black, and inwardly suffused with pale purplish; wings hyaline, the veins black, about basal third dark fuscous, extreme posterior and apical margins fuscous; vertex about as long as breadth between eyes,

broadly rounded anteriorly, a fine central longitudinal incised line on its basal area; pronotum finely wrinkled, more or less foveately depressed on lateral areas; face centrally longitudinally broadly granulose, the lateral areas strongly transversely striate.

Var. a.—Abdomen wholly black or piceous black.

Var. b.—Vertex, pronotum, scutellum, apex of abdomen above, and body beneath and legs ochraceous.

Long., excl. tegm., 12 $\frac{1}{2}$ mm.; exp. tegm. 24–27 mm.

Hab. Ecuador; Archidona (*Haensch*, Brit. Mus.); Bolivia (*Steinbach*, Brit. Mus.); Peru (Brit. Mus.).

I have fixed as type the specimen received as Breddin's co-type, and named *O. venosula*, an apparently MS. name.

Oncometopia virescens, sp. n.

Vertex, scutellum, abdomen above, body beneath, and legs ochraceous; pronotum and a spot at each basal angle of scutellum olivaceous green; apex of face and the clypeus black; tegmina dull olivaceous as far as the apical area and obliquely truncately terminating a little before the transverse veins defining the apical cells, between its outer margin and the transverse veins defining the anteaapical cells the colour is darker and more purplish, apical area (extending inwardly to apex of clavus) pale ochraceous; wings pale fuliginous, the disk hyaline, and the extreme basal area piceous; vertex smooth, as long as breadth between eyes, its apical margin subtruncate; face broadly longitudinally centrally flattened and finely granulose, the lateral areas transversely striate; pronotum finely wrinkled, foveately depressed on each lateral area; scutellum a little depressed near middle and with a subapical dark spot.

Var.—Abdomen above black, the lateral margins spotted with ochraceous; scutellum without the spots at basal angles.

Long., excl. tegm., 14 mm.; exp. tegm. 27 mm.

Hab. Peru (Brit. Mus.).

The varietal form is represented by an unlocalized specimen from the "Fry Collection" now in the British Museum, and is probably from Southern Brazil.

Oncometopia brasiliensis, sp. n.

Vertex ochraceous, the lateral and basal areas very pale castaneous; pronotum castaneous, mottled with ochraceous, which colour is more pronounced on its anterior area; scutellum ochraceous, its basal margin castaneous; abdomen

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above black, the apex and lateral margins ochraceous; body beneath and legs ochraceous; tegmina castaneous, mottled with ochraceous, this dark coloration extending to a little before the basal transverse veins of the apical cells, the larger of the ochraceous mottlings are costal and macular, very distinct on clavus and forming a spot above apex of clavus, apical area extending inwardly to claval apex, ochraceous; vertex about as long as breadth between eyes, somewhat truncately rounded anteriorly; pronotum finely wrinkled, strongly foveately depressed on each lateral area; scutellum transversely linearly impressed behind middle; face broadly, centrally, longitudinally flattened and finely granulose, the apical areas transversely striate.

Long., excl. tegm., 14 mm.; exp. tegm. 27 mm.

Hab. Brazil (Brit. Mus.).

The specimen from which this species is described was presented by the late Mr. Wm. Wilson Saunders, and was probably procured by one of his South-American collectors.

Oncometopia capito, sp. n.

Vertex lilacinous, two small central oblique spots near apex and an annulation to each ocellus, which is obliquely connected with the lateral margin and longitudinally with the basal margin, black; eyes ochraceous; pronotum black, the posterior half thickly and finely mottled with greyish, the anterior half more sparingly but more largely mottled with ochraceous; scutellum lilacinous, a short longitudinal line enclosing basal angles, a short central transverse impression and the apex black; abdomen above black, lateral marginal spots, posterior margin of apical segment, and anal segment (excluding base) lilacinous; body beneath lilacinous; three small spots on basal margin of face, central apical area of face and clypeus, disk of sternum, and segmental margins and central spots to abdomen black; legs ochraceous, tibiae somewhat lilacinous; tegmina dull dark brownish, thickly irrorated with small pale ochraceous or greenish spots, the apical area extending inwardly to claval apex ochraceous; wings hyaline, the veins black, apex and posterior margin fuliginous; vertex as long as breadth between eyes, truncately rounded in front, foveately depressed before eyes; face centrally broadly longitudinally depressed and finely granulose, lateral margins transversely carinate; pronotum foveately depressed on each lateral area.

Long., excl. tegm., 11 mm.; exp. tegm. 19 mm.

Hab. South Brazil; Therseopolis (Brit. Mus.); Large (Coll. Dist.).

Oncometopia tomentosa, sp. n.

Vertex, pronotum, and scutellum brownish ochraceous, the vertex, anterior area of pronotum, and scutellum more or less pale violaceous tomentose; abdomen above bluish black, the segmental margins brownish, the lateral and apical margins greyishly tomentose; body beneath and legs brownish ochraceous and more or less thickly greyishly tomentose; tegmina very pale testaceous, somewhat thickly sprinkled with small greyish dots, more prominently so on costal and claval areas, the apical cells ochraceous and practically unspotted; wings fuliginous, the veins black; vertex shorter than breadth between eyes, truncately rounded in front, medially a little depressed; face centrally broadly flattened where it is finely granulose and with a faint central longitudinal line, lateral areas strongly transversely striate, the sides of the face and cheeks thickly greyishly tomentose; pronotum coarsely punctate and wrinkled; anterior tibiae sulcate.

Long., excl. tegm., 11 mm.; exp. tegm. 20 mm.

Hab. Ecuador; Chimbo (Rosenberg, Brit. Mus.).

Oncometopia fowleri, sp. n.

Tettigonia speculifera, Sign. (nec Walk.) Ann. Soc. Ent. Fr. (3) ii. p. 488, t. xvii. fig. 1 (1854).

Oncometopia speculifera, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 283, t. xiv. fig. 25 (1899).

Hab. Mexico.

Walker's unlocalized species is a much larger insect, differently spotted on the vertex and pronotum; face longer and more deflected before clypeus than in *O. fowleri*, its basal half black, apical half castaneous, and the lateral carinate areas ochraceous.

Oncometopia peruviensis, sp. n.

Vertex, pronotum, and scutellum ochraceous; vertex with two central spots in longitudinal sequence, which are delineated by black margins, the apical one rounded, the basal spot angulate, oblique black striae on lateral apical areas; pronotum with reticulate castaneous lines delineating spots, of which one on each lateral area and one central are rounded, and between these on each side is a long subquadrate spot almost divided by a transverse castaneous line; scutellum with castaneous lines and shadings on basal half delineating a small spot at each basal angle, a transverse

spot at base immediately followed by two oblique spots, and an angulate spot occupying the apical area; abdomen above testaceous; body beneath and legs pale ochraceous; apical area of face and the clypeus shining black, clypeus with an ochraceous spot on each side of base; lateral areas of segmental margins blackish or the whole ventral surface pale concolorous; tegmina castaneous, the veins and a number of irregular spots ochraceous, the spots irregular in shape and size, but not extending to the apical cells, which are dull ochraceous and unspotted; wings pale bronzy, the apical and posterior margins infuscate; vertex as long as breadth between eyes, broadly rounded in front, a short incised longitudinal line at base; face broadly centrally longitudinally flattened, finely and obscurely granulose, the lateral areas transversely striate; pronotum almost smooth, neither punctate nor striate; anterior tibiae sulcate.

Long., excl. tegm., ♀ 13½ mm.; exp. tegm. 26 mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Oncometopia personata.

Tettigonia personata, Sign. Ann. Soc. Ent. Fr. (3) ii. p. 364, t. xii. fig. 14 (1854).

Aulicizes magnifrons, Walk. List Hom., Suppl. p. 238 (1858).

Hab. Brazil.

Genus STICTOSCARTA.

Stictoscarta, Stål, Hem. Fabr. ii. p. 61 (1869).

Type, *S. sulcicollis*, Germ.

Stictoscarta murcia, sp. n.

Vertex dull ochraceous, cruciformly banded with black, the central longitudinal line broadened apically and basally, the transverse line immediately in front of the ocelli; pronotum ochraceous, a central longitudinal line, a narrow irregular transverse fascia near anterior margin, a waved transverse fascia on basal area (sometimes continued to base), and a longitudinal line on each lateral area connecting the two transverse fasciae, castaneous; scutellum greenish ochraceous, with two large spots at basal angles which are narrowly fused on basal margin and again transversely connected near middle, black; abdomen above testaceous; body beneath pale ochraceous; face mottled with piceous; clypeus castaneous; legs more or less brownish; tegmina

dull ochraceous, sparingly and irregularly suffused with castaneous brown, the veins also of that colour; wings pale bronzy, the veins darker; vertex considerably shorter than breadth between eyes, anteriorly rounded, centrally foveately depressed at apex, and with a central longitudinal incised line; clypeus strongly angularly elevated; pronotum about or almost twice as long as scutellum, finely rugulose and very coarsely punctate, the basal margin somewhat strongly sinuate, lateral margins moderately oblique, the pronotum narrowing anteriorly.

Long., excl. tegm., ♀ $17\frac{1}{2}$ mm.; exp. tegm. 35 mm.

Hab. Amazons; Nanta (Brit. Mus.); Ecuador; Cuenca (Brit. Mus.).

Stictoscarta linearis.

Aulacizes linearis, Walk. List Hom. iii. p. 791 (1851).

Tettigonia atomaria, Sign. (part.) Ann. Soc. Ent. Fr. (8) iii. p. 57 (1855).

Signoret placed *linearis*, Walk., and *atomaria*, Walk., as synonyms and under the latter name. This is incorrect. *A. atomaria*, Walk., = *adspersa*, Fabr., and is a *Ciclopola*.

Genus AMBLYDISCA.

Amblydisca, Stål, Hem. Fabr. ii. p. 61 (1869); Fowl. (part.), Biol. Centr.-Am., Rhynch. Hom. ii. p. 209 (1898).

Type, *A. rubriventris*, Sign.

Amblydisca ebza, sp. n.

Piceous brown, finely mottled with ochraceous; vertex with the lateral and apical margins ochraceous; lateral margins of pronotum narrowly dull ochraceous; scutellum with two large piceous spots, one at each basal angle, the apical area dull ochraceous; body beneath and legs fuscous brown; face and central ridge to clypeus dull ochraceous; abdominal segmental margins and base of anal segment black; tegmina piceous or fuscous brown, crossed before middle by an oblique series of three small ochraceous spots and beyond middle by a more obscure curved series of similar spots, all these spots more or less margined with black; wings blackish; vertex about as long as breadth between eyes, apically narrowed, upturned, broadly foveately depressed, rounded in front; pronotum scarcely longer than scutellum, rugulose, obscurely punctate, anteriorly narrowed, the lateral margins oblique, the disk with three obscure

longitudinal ridges, the lateral areas foveately depresso ss basal margin moderately sinuate; clypeus angularly elevated.

Long., incl. tegm., 16 mm.

Hab. Ecuador; Cachabé (Rosenberg, Brit. Mus.).

A species allied to *A. coriacea*, Stål, but differing by the longer and upturned vertex.

Amblydisca cirta, sp. n.

Vertex pale dull ochraceous, with a broad, central, longitudinal, piceous fascia, which is broadest between the ocelli and narrows to apex; pronotum pale yellowish, sparingly darkly punctate, two transverse piceous lines on anterior area which laterally broaden into spots behind the inner margins of eyes, a central longitudinal line and a curved longitudinal line on each lateral area, all centrally connected with an undulating transverse line, testaceous; scutellum black, with three large pale ochraceous spots in central longitudinal series; body beneath and legs pale ochraceous, abdomen beneath with a violaceous hue; face with the central depression piceous, transversely connected by the same colour with the lateral margins before middle; clypeus (excluding base) and large spots to prosternum purplish black; tegmina purplish, largely suffused with ochraceous, veins ochraceous, outside clavus the ochraceous suffusions exhibit more or less distinctly four irregular transverse macular fasciae, apical cells distinctly paler; vertex considerably shorter than breadth between eyes, anteriorly obtusely angulate, centrally foveately depressed on apical area; face broadly centrally flattened and slightly depressed, lateral areas transversely striate; clypeus centrally angularly elevated; pronotum about as long as scutellum, the basal margin strongly centrally angularly sinuate, somewhat densely coarsely punctate, anteriorly narrowed, the lateral margins oblique; tegmina coarsely punctate, the claval area more densely so.

Long., incl. tegm., ♀ 15½ mm.

Hab. Ecuador; Cuenca (Brit. Mus.).

Amblydisca luridescens.

Aulacizes luridescens, Walk. List Hom., Suppl. p. 240 (1858).

Hab. Venezuela.

Amblydisca amida, sp. n.

Vertex, pronotum, and scutellum castaneous; abdomen above ochraceous; body beneath and legs castaneous brown,

more or less greyishly tomentose; clypeus with a golden-yellow spot on each lateral area, this spot is very distinct in some specimens and almost obsolete in others; tegmina pale castaneous brown, the apical cells ochraceous, claval area (excluding apex) and a large, broad, longitudinal, fasciate spot above clavus, which is interrupted near base, greyish white, thickly and minutely speckled with pale castaneous brown (in some specimens these pale areas are fused); three pale greyish-white spots before apex, two placed one above the other and the larger and more oblique beyond them; wings pale bronzy brown, the apical area darker; vertex about as long as breadth between eyes, centrally, broadly, longitudinally foveately impressed, more narrowly rounded at apex; face broadly longitudinally flattened and slightly depressed, the lateral areas transversely striate; clypeus centrally angularly elevated; pronotum about as long as scutellum, posterior margin centrally angularly sinuate, anteriorly narrowing, the lateral margins oblique, distinctly somewhat thickly punctate.

Long., excl. tegm., ♀ $11\frac{1}{2}$ mm.; exp. tegm. 20 mm.

Hab. Ecuador; Cachabé and Paramba (Rosenberg, Brit. Mus.).

Amblydisca ofella, sp. n.

Vertex ochraceous, the basal angles more or less purplish; pronotum and scutellum castaneous; abdomen above more or less testaceous, the margins of the segments a little darker; body beneath pale brownish ochraceous; face pale ochraceous; apex of the central raised angulation to clypeus and the tibiae and tarsi black; femora castaneous; tegmina dull ochraceous, the apical margin narrowly black, costal and posterior claval margins very narrowly piccous, disk above clavus with small greyish-white spots; wings pale bronzy; vertex short, broad, shorter than breadth between eyes, truncately rounded at apex, broadly foveately impressed on disk, a little hollowed and outwardly ridged before eyes; pronotum about as long as scutellum, the sides moderately anteriorly narrowed, transversely grooved near anterior margin; face centrally broadly longitudinally flattened, lateral areas transversely ridged; tegmina in male elongate, normal in female, short and broad.

Long., excl. tegm., ♂ 15, ♀ 16 mm.; exp. tegm., ♂ 35, ♀ 28 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.); Peru; Chandramayo and R. Toro (Brit. Mus.).

Allied to *A. superciliaris*, Jacobi.

ABANA, gen. nov.

Vertex as long as breadth between eyes, anteriorly narrowed, apically obtusely rounded, centrally longitudinally depressed; face long, globose, the base angularly produced, centrally, broadly, longitudinally flattened, the lateral areas transversely striate; clypeus centrally angularly elevated; pronotum nearly twice as long as scutellum, convex, anteriorly narrowed, lateral margins oblique, anterior margin convexly rounded, posterior margin concavely sinuate; scutellum posteriorly acute; tegmina not longer than abdomen, in female not covering the anal appendage; anterior tibiae sulcate.

Allied to *Stictoscarta*, but differing by the angularly produced vertex, the more elongate face, longly produced anal appendage in female, &c.

Type, *A. dives*, Walk.

Aniblydisca gigas, Fowl., belongs to this genus.

Abana dives.

Aulacizes dives, Walk. List Hom. iii. p. 791 (1851).

Vertex ochraceous, basal margin angularly widened on each side and thus enclosing the ocelli, black or bluish black; pronotum dark castaneous, more piceous, and sometimes shaded with bluish on anterior marginal area, a broad transverse ochraceous fascia crossing middle, sometimes centrally interrupted; scutellum piceous; abdomen above dark indigo-blue; body beneath ochraceous; apical area of face, cheeks, clypeus, disk and a sublateral fascia on each side of mesosternum, and the segmental margins bluish black or castaneous; legs castaneous, anterior and intermediate femora beneath more or less flavescent; tegmina castaneous, the veins margined with minute greyish speckles; wings fuscous brown, the veins darker, sometimes distinctly paler on basal area.

Structural characters as in generic diagnosis.

Var. a.—Pronotum uniformly castaneous, the transverse pale fascia absent.

Long., excl. tegm., 16 mm.; exp. tegm. 33 mm.

Hab. Colombia; Cali (Brit. Mus.). Ecuador; Cachabé and Paramba (Rosenberg, Brit. Mus.).

Considerable confusion has attached to this species; Signoret (Ann. Soc. Ent. Fr. (3) i. p. 672, 1858) has placed it as a synonym of *T. cærulescens*, Fabr., and given the habitat as "N. Holland." He has also figured (t. xxi,

fig. 16) the species of Fabricius, which is quite distinct from Walker's species and evidently belongs to another genus. Signoret also mentions that it is contained in the "Coll. Banks" under the name of *cæruleopennis*, Fabr. The Banksian Collection in the British Museum contains no such species, and Fabricius described both his *cæruleopennis* and *cærulescens* as "Dom. de Billardiere." Walker's type is unlocalized, but is certainly Neotropical, as proved by other specimens.

Abana tissa, sp. n.

Vertex, pronotum, and scutellum dark castaneous; abdomen above bluish black; body beneath and legs castaneous; checks, inner area of prosternum, disks and lateral margins of meso- and metasterna, and the margins to the abdominal segments beneath flavescent; tegmina castaneous, with three short longitudinal flavescent fasciæ on disk above the claval suture; wings pale fuscous, the veins black; vertex as long as breadth between eyes, obtusely rounded in front, anteriorly narrowed, apically centrally foveately depressed and with a central longitudinal incised line on basal area; face elongate, centrally broadly longitudinally flattened and obscurely striate, a short central ridge at the base, lateral areas transversely striate; clypeus centrally angularly elevated; pronotum coarsely granulose; scutellum transversely laterally striate on apical area, where it is also centrally depressed; tegmina more or less strongly granulose at margins of the veins, more coarsely so on claval area.

Long., excl. tegm., 18 mm.; exp. tegm. 32 mm.

Hab. Ecuador; Cachabé (Rosenberg, Brit. Mus.).

Abana drusilla, sp. n.

Vertex greyish, the basal margin angularly enlarged on each side and almost enclosing the ocelli, black; pronotum and scutellum ochraceous, the former a little narrowly piceous on anterior margin; body beneath pale greyish or flavescent; face (excluding about basal half) and clypeus umber-brown; inner margins of cheeks, disk of sternum, curved longitudinal fasciæ to lateral areas of meso- and metasterna; and broad segmental margins to abdomen beneath, black or piceous black; legs yellowish; tegmina ochraceous, on nearly apical half piceous between the veins; vertex about as long as breadth between eyes, centrally slightly longitudinally depressed; face centrally broadly flattened and finely longitudinally striate, the lateral areas

somewhat finely transversely striate; clypeus obtusely centrally angularly elevated; tegmina somewhat regularly granulose at margins of veins.

Long., incl. tegm., ♀ 20 mm.

Hab. Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

Genus Cœlopola.

Cœlopola, Stål, Hem. Fabr. ii. pp. 61 & 65 (1860).

Type, *C. adspersa*, Fabr.

Cœlopola adspersa.

Cicada adspersa, Fabr. Syst. Rhyng. p. 61. 2 (1803).

Aulacizes atomaria, Walk. List Hom. iii. p. 792 (1851).

Tettigonia atomaria, Sign. (part.) Ann. Soc. Ent. Fr. (3) iii. p. 57 (1855).

Cœlopola adspersa, Stål, Hem. Fabr. ii. p. 65 (1860).

Cœlopola canaliculata.

Cicada canaliculata, Fabr. Syst. Rhyng. p. 63. 8 (1803).

Aulacizes viridivitta, Walk. List Hom. iii. p. 794 (1851).

Tettigonia canaliculata, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 230 (1855).

Aulacizes triplaga, Walk. Ins. Saund., Hom. p. 100 (1858).

Cœlopola canaliculata, Stål, Hem. Fabr. ii. p. 66 (1860).

Signoret's figure (t. xii. fig. 5, 1855) is not typical.

Genus AULACIZES.

Aulacizes, Amy. & Serv. Hist. Hém. p. 571 (1813).

Type, *A. quadripunctata*, Germ.

Aulacizes phalasia, sp. n.

Vertex and pronotum stramineous; an arcuate line at base of vertex, a transverse fasciate subanterior line to pronotum, and the basal margin of same castaneous; scutellum castaneous; abdomen above sanguineous; head beneath, sternum, and legs pale ochraceous; abdomen beneath dull sanguineous; clypeus usually more or less piceous; tegmina subhyaline, tali-like, the veins and apical margin yellowish green, extreme base, a transverse line near base, a transverse fasciate line beyond middle, and a broad subapical margin which posteriorly extends inward to apex of clavus, dark purplish; wings pale bronzy, the veins purplish, extreme base sanguineous; vertex shorter than breadth between eyes, centrally longitudinally foveately depressed, the apex truncately rounded; face broadly longitudinally flattened and depressed,

the lateral areas strongly transversely striate; pronotum strongly transversely striate, little more than half as long as broad at base, slightly narrowing anteriorly, the lateral margins moderately oblique.

Var.—Tegmina without the transverse lines, and the subapical marginal fascia much narrowed.

Long., excl. tegm., 10½ mm.; exp. tegm. 23 mm.

Hab. Colombia (Brit. Mus.). Bolivia; Toungas de la Paz (Brit. Mus.).

Aulacizes cleasa, sp. n.

Vertex and pronotum pale greyish stramineous, the first with a small central spot at apex and the ocelli black, the latter with the basal margin, a central longitudinal fascia not reaching anterior margin, and a short transverse line on each side before middle dark purplish; scutellum stramineous; abdomen above reddish ochraceous, its apex stramineous; body beneath and legs pale flavescent, abdomen beneath dark shining stramineous; tarsi ochraceous, the claws piceous; tegmina pale brownish testaceous, with five large dark shining stramineous spots, the three smaller near base, one near middle above clavus, and the fifth subapical, the apical cells dull hyaline; wings hyaline, the veins and apical area pale brownish; vertex almost as long as breadth between eyes, centrally, longitudinally, somewhat narrowly impressed, its apex subtruncately rounded; face broadly, centrally, longitudinally depressed, the lateral areas transversely striate, the basal margin a little sinuate, the central black spot above visible beneath; pronotum strongly transversely striate, more than half as long as broad at base.

Long., excl. tegm., 10 mm.; exp. tegm. 21 mm.

Hab. Bolivia (J. Steinbach, Brit. Mus.).

Aulacizes æmilia, sp. n.

Vertex, pronotum, and scutellum shining black; margins of eyes and three transverse spots on each lateral area of the pronotum pale ochraceous or stramineous; head beneath and sternum black; legs and abdomen beneath sanguineous; apex of abdomen and anal appendage black; rostrum ochraceous; tegmina pale bronzy brown, much marked and spotted with pale ochraceous or stramineous, these markings are as follows:—the greater part of inner claval area, above clavus a marginal series of irregular spots, and a large transverse spot before apex; vertex elongate, longer than breadth between eyes, from a little above ocelli broadly longitudinally

foveate, narrowed in front of eyes and subconically rounded at apex; face elongate, subglobose, broadly longitudinally flattened on disk, the lateral areas finely transversely striate, near base shortly, distinctly, foveately depressed; pronotum scarcely longer than vertex, closely transversely striate, the lateral margins nearly straight, somewhat obscurely transversely impressed behind eyes; scutellum slightly gibbous at base, broadly, strongly, transversely depressed near middle.

Long., incl. tegm., ♀ 13 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.).

Aulacizes alalia, sp. n.

Vertex, pronotum, and scutellum black; vertex with some greyish linear spots between eyes and ocelli; pronotum with transverse series of irregular, macular, virescent lines from a little beyond base to apex; abdomen above sanguineous, the apex more or less black; head beneath and sternum black, legs and abdomen beneath sanguineous, the anal segment black; tegmina brownish testaceous, thickly sprinkled with small pale annulations, a large pale stramineous spot at base; wings hyaline, the veins piceous, the apex and outer margin fuscous; vertex elongate, longer than breadth between eyes, broadly foveately depressed for half its apical length, a central incised longitudinal line on basal area; face elongate, profoundly foveate at base, after which it is centrally, broadly, longitudinally flattened, the lateral areas finely transversely striate; pronotum scarcely longer than vertex, closely transversely striate; scutellum broadly transversely depressed a little behind middle.

Long., excl. tegm., 10-12 mm.; exp. tegm. 19-21 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.).

By the elongate vertex and slender form allied to the preceding species, *A. emilia*.

Aulacizes maculata.

Aulacizes maculata, Walk. List Hom. iii. p. 793 (1851).

Aulacizes terminalis, Walk. loc. cit.

Tettigonia affinis, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 227 (1855).

Aulacizes affinis, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 217 (1899).

Signoret having placed a number of distinct genera under *Tettigonia* was thus led to treat as preoccupied many specific names. The *A. maculata*, Walk., is not preoccupied in *Aulacizes*. The *Cicus maculatus*, Walk., to which Signoret refers belongs to the genus *Acrocampa*, Stål, and = *A. pallipes*, Fabr.

Aulacizes insistans.

Proconia insistans, Walk. List Hom., Suppl. p. 232 (1858).
Aulacizes obtusa, Walk. loc. cit. p. 239.

Hab. Rio Janeiro.

Aulacizes annuligera.

Proconia annuligera, Walk. List Hom., Suppl. p. 232 (1858).

Hab. Rio Janeiro.

Aulacizes conspersa.

Aulacizes conspersa, Walk. List Hom. iii. p. 792 (1851).
 Var. *Proconia persistans*, Walk. loc. cit., Suppl. p. 231 (1858).

Hab. Rio Janeiro.

MAREBA, gen. nov.

Vertex broad, robust, as long as breadth between eyes and as long as the pronotum, centrally longitudinally depressed, a distinct foveation near each ocellus, subconically produced in front, narrowing from eyes to apex; face elongate, longitudinally broadly flattened and depressed from near base to clypeus; clypeus scarcely or not elevated; pronotum rugulose and coarsely punctate, the basal margin somewhat prominently concavely sinuate in front of scutellum, narrowing from base to apex, the lateral margins oblique; scutellum subtriangular, its apex slenderly acutely produced; tegmina short and broad, scarcely longer than abdomen, their apices rounded; legs somewhat short and robust, the anterior tibiae sulcate.

Type, *M. eresia*, Dist.

Allied to *Aulacizes*, and including the *Aulacizes insignior*, Fowl. The figure of the latter species in the 'Biologia' is structurally inexact, being much too elongate; it represents the tegmina as being nearly twice as long as the vertex, pronotum, and scutellum taken together, whereas in the unique type they are only about one-fourth longer.

***Mareba eresia*, sp. n.**

Above brownish ochraceous; body beneath somewhat pale ochraceous; central longitudinal disk of the face black; legs piceous, apices of the femora castaneous, posterior tibiae ochraceous; more than apical third of the tegmina piceous black, with small obscure ochraceous spots, the apical

margin narrowly ochraceous; vertex and face as described in generic diagnosis; pronotum finely rugulose and coarsely punctate; tegmina coarsely thickly punctate, less so but much more wrinkled on the black apical area; tegmina scarcely one-fourth longer than the vertex, pronotum, and scutellum taken together.

Long., incl. tegm., 15 mm.

Hab. Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

TELETUSA, gen. nov.

Vertex shorter than breadth between eyes, broad, the apex subtruncate, centrally, broadly, longitudinally foveate from apex almost to basal margin, ocelli near base, closer to eyes than to each other; face somewhat long and rounded, the disk broadly centrally depressed, moderately foveate, lateral areas strongly transversely striate; clypeus at right angles with the face, slightly compressed; pronotum longer than vertex, arched, the lateral margins sinuate but almost parallel, posterior margin a little sinuate before scutellum, posterior angles slightly rounded and inwardly posteriorly oblique; scutellum about as long as pronotum, its apical area (sometimes as in type) adorned with tufts of long hairs; legs of moderate length, the anterior tibiae broadly dilated and broadly sulcate, posterior tibiae somewhat longly spinulose; tegmina somewhat longly passing the apex of the abdomen, a little valvate behind apex of clavus, posterior costal area with four or five transverse veins, apparently inconstant in number.

Type, *T. paraguayensis*, Dist.

By the structure of the head allied to *Aulacizes*, but widely differing by the dilated anterior tibiae, the transversely veined posterior portion of the costal area, &c.

a. Apical area of the scutellum adorned with tufts of long hairs.

***Teletusa paraguayensis*, sp. n.**

Vertex dull brownish ochraceous, anterior margin broadened at the lateral angles, shining black, the central foveation piceous at base; pronotum and scutellum piceous brown, the latter with the apical area adorned with tufts of long black hairs and margined on each side with a metanotal fasciate stramineous spot; abdomen above dull black, the margins of the last two segments obscurely stramineous; body beneath and legs black; central area of the face and an apical annulation to the posterior tibiae brownish ochraceous, anal

segment dark castaneous; tegmina bronzy brown, a narrow transverse fascia near base above claval area and a broad transverse fascia before apex subhyaline; wings subhyaline, the veins piceous, structural characters as in generic diagnosis.

Long., excl. tegm., ♀ 9 mm.; exp. tegm. 20 mm.

Hab. Paraguay; San Bernardino (K. Fiebrig, Brit. Mus.).

b. *Apical area of the scutellum not hirsute.*

Teletusa peruviensis, sp. n.

Vertex, pronotum, and scutellum black, sparingly finely pilose; a small spot on vertex near each ocellus and lateral margins and two small transverse spots near anterior margin of pronotum stramineous; apical area of scutellum margined on each side with a metanotal fasciate stramineous spot; abdomen above black, a transverse stramineous spot on the lateral margins of second segment, the posterior margins of the last two segments obscurely narrowly stramineous; head beneath, sternum, and legs black; a lateral longitudinal fascia on each side of face, a broad subapical annulation to the intermediate and posterior tibiae, and the abdomen beneath stramineous, the latter with some large spots on the connexivum, and the anterior margin of the third segment, black, in many specimens the abdomen beneath is black, with only the two basal segments stramineous; tegmina with the basal half pale brownish, the apical half subhyaline, all the veins piceous; wings hyaline, with the veins piceous; anterior tibiae broadly dilated and broadly sulcate.

Long., excl. tegm., 7 mm.; exp. tegm. 18 mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Teletusa neotropicalis, sp. n.

Vertex black, ocelli very narrowly margined with ochraceous; pronotum testaceous, the lateral margins narrowly stramineous, the anterior margin broadly black and containing two transverse stramineous spots; scutellum black, its apical area margined on each side with a metanotal fasciate testaceous spot; head beneath, sternum, and legs black; a lateral longitudinal fascia on each side of face, posterior margin of prosternum, a broad subapical annulation to intermediate and posterior tibiae, and the abdomen beneath stramineous, the latter strongly marked with black on the posterior half and on the connexivum; tegmina with more than the basal half ochraceous, remaining area subhyaline, with the veins piceous, near middle the costal area is more

or less suffused with piceous; anterior tibiae broadly dilated and broadly sulcate.

Long., incl. tegm., ♂ 10 mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Genus DICHROPHLEPS.

Dichrophleps, Stål, Hem. Fabr. ii. p. 62 (1869).

Type, *D. aurea*, Fabr.

Dichrophleps aurea.

Cicada aurea, Fabr. Syst. Rhyng. p. 63. 10 (1803).

Proconia cingulifera, Walk. Ins. Saund., Hom. p. 99 (1858).

Genus HOMALODISCA.

Homalodisca, Stål, Hem. Fabr. ii. p. 63 (1869).

Type, *H. triquetra*, Fabr.

Homalodisca triquetra.

Cicada triquetra, Fabr. Syst. Rhyng. p. 63 (1803).

Homalodisca triquetra, Ball, Iowa Acad. Sci. viii. p. 47, t. ii. fig. 1 (1901).

To the synonymy given by Ball (*suprð*), add:

Proconia excludens, Walk. Ins. Saund., Hom. p. 98 (1858).

This carries the distribution of the species as far south as Venezuela.

Genus PHERODES.

Pherodes, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 225 (1899).

Type, *P. flammeicolor*, Fowl.

Pherodes sagittarius.

Cicus sagittarius, Walk. List Hom., Suppl. p. 245 (1858).

Hab. Amazons.

Genus ACROCAMPSA.

Acrocampa, Stål, Hem. Fabr. ii. p. 66 (1869).

Type, *A. pallipes*, Fabr.

*Acrocampa dorsivitta.**Ciccus dorsivitta*, Walk. List Hom. iii. p. 802 (1851).*Tettigonia dorsivittata*, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 517 (1855).

The figure given by Signoret (t. xxi. fig. 10) represents a species with the apices of the tegmina rounded; in Walker's species they are truncate.

*Acrocampa excavata.**Proconia excavata*, Lep. & Serv. Encycl. Méth. x. p. 611 (1825).*Ciccus rufifacies*, Walk. List Hom. iii. p. 802 (1851).*Ciccus intermedius*, Walk. loc. cit. p. 803.*Ciccus cinctipes*, Walk. loc. cit.

Tettigonia excavata, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 518 (1855),
excl. *C. fulvofasciatus*, Gray, and *C. pervirgatus*, Am. & Serv.

Genus *Ciccus*.*Ciccus*, Latr. Règn. Anim. ed. ii. v. p. 221 (1829).Type, *C. latreillei*, Dist.

Latreille gave as type for this genus the *C. adspersa*, Fabr. *Ciccus* was afterwards more fully described by Amyot and Serville, who employed the same species for type, and this was figured by the latter writers and also by Blanchard. This species, however, is not the *C. adspersa*, Fabr., which has been accurately fixed by Stål, and is the type of his genus *Calopola*. The species thus erroneously identified requires a new name.

Ciccus latreillei, n. nom.*Ciccus adspersa*, Latr. (nec Fabr.) Règn. Anim. ed. ii. v. p. 221 (1829).*Tettigonia adspersa*, Burm. (nec Fabr.) Handb. Ent. ii. l. p. 119 (1839);

Blanch. Hist. Nat. Ins. iii. p. 192, t. xiv. fig. 6 (1840); Sign. (part.)*
Ann. Soc. Ent. Fr. (3) iii. p. 767, t. xxiii. fig. 2 (1855).

Genus *DIESTOSTEMMA*.*Diestostemma*, Amy. & Serv. Hist. Hém. p. 572 (1843).Type, *D. albipennis*, Fabr.*Diestostemma biolleyi*, sp. n.

Vertex, pronotum, and scutellum pale brownish ochraceous; abdomen above pale ochraceous; body beneath and

* Signoret includes the *C. obliquus*, Walk., as a synonym, which seems to be a distinct species.

legs pale brownish ochraceous; central disks of face and clypeus very pale ochraceous; tegmina with the costal area, the veins to corium, and the posterior margin of clavus castaneous brown, the corium greyish, claval area very pale ochraceous, the margin of tegmen beyond apex of clavus piceous brown; wings hyaline; vertex about as long as breadth between eyes, obliquely narrowed to apex, discally flattened and almost smooth, depressed before ocelli, the lateral margins obscurely wrinkled, ocelli near eyes; face centrally, broadly, longitudinally flattened, a little foveately depressed, a more distinct central basal foveation, lateral areas transversely striate; pronotum about as long as vertex, rugulose, the anterior margin more rugose, the anterior margins very narrowly black, posterior margin strongly sinuate before scutellum; tegmina with the costal area granulose, the claval area thickly wrinkled and finely granulose, corium very finely granulose, its dark veins very prominent.

Long., excl. tegm., 16 mm.; exp. tegm. 32 mm.

Hab. Costa Rica; Cervantes, Atl. slopes and San José (*P. Biolley*, Coll. Dist.). Panama; Chiriquí (Brit. Mus.).

Dicostemma ptolyca, sp. n.

Vertex pale ochraceous, its base more or less testaceous brown; pronotum testaceous brown, its basal margin pale ochraceous; scutellum greyish, with testaceous-brown spots on disk and basal margin; head beneath, sternum, and legs stramineous, the abdomen beneath more greyish; tegmina greyish white, posterior claval and tegminal margins (narrowly) and an undulating subcostal line before middle chocolate-brown; vertex about as long as breadth between eyes, obliquely narrowed to apex, which is subconically rounded, a little flattened and depressed before ocelli, the lateral margins obscurely wrinkled; face centrally, longitudinally, broadly flattened and depressed, distinctly roundly foveate at centre of base, lateral areas strongly transversely striate; clypeus with a subcentral transverse impression; pronotum about as long as the vertex, rugulose, the anterior margin more rugose, posterior margin strongly sinuate before scutellum; tegmina very finely wrinkled and punctate.

Long., incl. tegm., 18 mm.

Hab. South Brazil; Theresopolis (Brit. Mus.).

Diestostemma stesilea, sp. n.

Vertex sanguineous, a large pale greyish spot near middle of each lateral margin and a much larger and more ochraceous-grey spot at base; pronotum obscure ochraceous, a central longitudinal carinate line and a broad sublateral fascia on each side sanguineous; scutellum sanguineous (imperfectly seen in type); abdomen above, body beneath, and legs pale ochraceous; face and clypeus sanguineous, the pale lateral spot on each side of vertex above continued and distinct on each side of face; vertex about as long as breadth between eyes, moderately narrowed to apex, which is rounded, ocelli near eyes; pronotum a little longer than vertex, rugulose, and in places coarsely granulose, a distinct transverse impression before anterior margin, strongly sinuate before scutellum; face broadly longitudinally flattened and depressed, roundly foveate at centre of base, the lateral areas transversely striate; tegmina greyish, with a pale flavescence tint, with a central, longitudinal, much waved, brownish line, very finely wrinkled and punctate, posterior claval and tegminal margins narrowly brownish; wings greyish, subhyaline.

Long., excl. tegm., ♀ 15½ mm.; exp. tegm. 34 mm.

Hab. Bolivia (Brit. Mus.).

Genus PROCONIA.

Proconia, St.-Farg. & Serv. Enc. Méth. x. p. 610 (1825).

Germaria, Lap. Ann. Soc. Ent. Fr. i. p. 222 (1832).

Zyza, Kirk. Entomologist, xxxiii. p. 243 (1900).

Type, *P. marmorata*, Fabr.

The type given by St.-Farg. & Serv. for *Proconia* was *P. cristata*, Fabr.; that given by Laporte for *Germaria* was *G. cucullata*. As will be seen by the following synonymy, both these species are synonyms of *C. marmorata*, Fabr., and the two genera must also therefore be synonymous. Kirkaldy's proposed new name constitutes another synonym.

Proconia marmorata.

Cicada marmorata, Fabr. Syst. Rhyng. p. 61. 1 (1803).

Cicada cristata, Fabr. loc. cit. p. 62. 4.

Germaria cucullata, Lap. Ann. Soc. Ent. Fr. i. p. 223 (1832).

Tettigonia marmorata, Sign. Ann. Soc. Ent. Fr. (3) iii. p. 765 (1855).

Germaria dorsigerista, Walk. Ins. Saund. p. 97 (1858).

Germaria marmorata, Stål. Hem. Fabr. ii. p. 59 (1869).

Zyza cucullata, Kirk. Entomologist, xxxiii. p. 243 (1900).

Genus *ZYZZOGETON*.

Zyzzogeton, Bredd. Soc. Entomol. xvi. p. 178 (1902).

Type, *Z. haenschi*, Bredd.

Zyzzogeton mazaria, sp. n.

Vertex, pronotum, and scutellum dark purplish brown; a large triangular longitudinal fascia to vertex (broader at apex and narrower at base) pale ochraceous; pronotum with two spots on disk between the lateral angles and one on each lateral area ochraceous; abdomen above, body beneath, and legs chocolate-brown, basal margin of face ochraceous; tegmina pale olivaceous green, inner and costal margins (narrowly), apical margin (broadly), apex of claval area, and a discal spot before apex dark purplish brown; wings fuscous brown; vertex about half the length of pronotum, centrally, broadly, foveately impressed, apically subtruncate, ocelli much nearer to eyes than to each other; face centrally, longitudinally, broadly foveate, the lateral areas transversely striate; clypeus compressed, centrally angularly elevated; pronotum rugulose and punctate, the lateral angles broadly, obliquely, obtusely, angularly elevated, anterior margin ridged, basal margin strongly angularly sinnuate before scutellum, lateral margins oblique, very slightly sinnuate; scutellum with the apical area finely transversely wrinkled; corium distinctly and somewhat thickly punctate.

Long., excl. tegm., 18 mm.; exp. tegm. 38 mm.; exp. pronot. angl. 6 mm.

Hab. Colombia (*R. Dagua*, Brit. Mus.). Ecuador; Paramba and Cachabé (*Rosenberg*, Brit. Mus.). Peru (Brit. Mus.).

IX.—*On Trichoniscoides albidus (Budde-Lund) and T. sarsi, Patience (nom. nov.).* By ALEXANDER PATIENCE.

[Plate VI.]

Fam. *Trichoniscidae*.

Gen. *TRICHONISCOIDES*, G. O. Sars.

I FIRST met with the species *Trichoniscoides albidus* (Budde-Lund) in company with *Trichoniscus pygmaeus*, G. O. Sars, and *T. stebbingi*, Patience, in a field near Alexandra Park, Glasgow, in the autumn of 1906. Some time afterwards I

recorded the species as new to the Scottish fauna*. There were no males in the few specimens I then took, but in April of 1907 I came across a somewhat extensive colony of the species, containing many males, at Gourock, on the Firth of Clyde. A careful examination of some male specimens showed some important differences in the structure of the first and second pairs of pleopoda and the seventh pereopod as compared with the figures of these organs given by Professor G. O. Sars in his great work 'The Crustacea of Norway'† under the name of *Trichoniscoides albidus* (Budde-Lund).

Dr. Budde-Lund very kindly sent me the drawings he had made of the first and second pairs of pleopoda of the male of that species, and they virtually agreed with the structure of these organs in the specimens I had under examination. Moreover, both Canon Norman and Professor Sars were good enough to send me Norwegian specimens of *Trichoniscoides* for comparison with the Scottish examples. I dissected a number of males, and found that the organs I have already referred to had been most faithfully represented by Sars, and these specimens were therefore specifically distinct from those I had found in Scotland, which latter I have but little hesitation in referring to Budde-Lund's species. I have therefore the pleasure of naming the former *T. sarsi*, in compliment to the distinguished Norwegian carcinologist.

The two species resemble each other in the general form of the body, but differ in the following important points of structure :—

T. sarsi.

First pair of pleopoda of male.

The opercular plate is "large, quadrangular, abruptly contracted at the tip, and prolonged to a setiform ciliated lash curved outwards, and accompanied inside by another much smaller seta." The outer lash is gracefully curved and is not constricted at the middle.

The outer corner of inner ramus is only slightly produced and is bluntly rounded at the tip.

T. albidus.

The opercular plate is broadly triangular, the outside margin being gently curved towards the tip, which is prolonged to two setiform ciliated lashes of equal size. Each lash is curved outwards, is constricted at about half its length, and then abruptly bent downwards. The outer margin is crenulated and there springs a cilium from each crenulation.

The outer corner of inner plate is greatly produced, being about $\frac{1}{3}$ of the total length, and is acutely rounded at the tip.

* Glas. Nat. Hist. Soc. 25th June, 1907.

† 'Crustacea of Norway,' vol. ii. Isopoda, pl. lxxiii. p. 165.

*T. sarsi.**T. albidus.*

Second pair of pleopoda of male.

The terminal joint of inner rami forms a narrow folded plate about twice the length of first joint, and terminates in a corkscrew-like point

The terminal joint of inner ramus is comparatively much narrower, more prolonged, being about three times the length of first, is contracted at a little beyond the middle of joint, and is then produced to a straight needle-like point.

First pair of pleopoda of female

The inner ramus appears to be comparatively larger, while the outer ramus is crenulated on the inner margin.

Seventh pereiopod of male

The meral joint is produced at the base on the inner side to a small dentiform prominence.

The meral joint has no dentiform prominence.

Antennæ.

The flagellum is composed of four articulations.

The flagellum is composed of three articulations, the middle joint being the longest.

The type of coloration in *T. albidus* is not unlike that of *Trichoniscus pusillus* (Brandt). The lighter patches on the back are of a golden-yellow colour, while the rest of the back, the legs, and the antennæ are diffused with light reddish brown. The specific name, as Sars long ago pointed out, is somewhat inappropriate. It is only specimens which have been preserved in alcohol or formalin that show a white colour. In the latter preservative, specimens lose their pigment in a very few days. The specific name has evidently misled the authors of 'The British Woodlice'*, for they state (p. 25), "From the first its white colour will serve to differentiate it."

The young, however, of *T. albidus* on leaving the female are pure white, with the exception of the eye, which has a brilliant ruby tint. Shortly afterwards a diffuse light reddish pigment is found on the back, forming slight ramifications on each side of the segments.

I think there can be little doubt as to the specific distinctness of *T. sarsi*, and my opinion upon this point has been endorsed by those two eminent carcinologists, Professor G. O. Sars and Professor Malcolm Laurie, F.L.S., to whom

* 'The British Woodlice,' London, 1906.

I submitted the matter. In forty-eight male specimens of *T. albidus* and seven male specimens of *T. sarsi* which I carefully dissected and examined the form and structure of the first and second pairs of pleopoda were constant, with one exception, in *T. albidus*, where the right opercular plate of the first pair of pleopoda was abnormal, only to the extent, however, of having three equal-sized lashes instead of the usual two. The structure of the seventh pereopod of the male in both species I also found to be constant in the above number of specimens examined.

Quite recently my friend Mr. R. S. Bagnall, F.E.S., Winlaton-on-Tyne, submitted to me for examination a number of specimens of *T. albidus* taken in the Kew Gardens, London, and at Newcastle-on-Tyne respectively. All the males exhibited, in the organs under consideration, the same kind of structure as was found in the Scottish examples. Of the other British species of the Trichoniscidae which I have examined, e. g. *Trichoniscus pygmaeus*, G. O. Sars, *T. stebbingi*, Patience, *T. spinosus*, Patience, and *Haplophthalmus danicus*, Budde-Lund, I have found the structure of the first and second pairs of pleopoda of the male to be virtually constant in each species.

Occurrence. I have met with *T. albidus* in many localities in the Clyde faunal area, from Stonyburn Falls, near Lanark, to as far south as Largs, on the Ayrshire coast, and in one or two places in fairly extensive colonies. It may be interesting to note that I have rarely found it far away from the river-bank or the sea-beach line. On the south bank of the river Clyde, opposite Bowling, where I found it associated with *Haplophthalmus mengii* (Zaddach) and *Trichonisus pygmaeus*, G. O. Sars, the stones under which it lives are almost lapped by the water at high tide, and on Hailio shore to the south of Largs it is within splash of the waves. It also occurs in the Island of Bute, being one of the species I found in Dr. Marshall's garden at Bally Place, Rothesay. On the eastern side of the Firth of Clyde, from Ashton to Fairlie, there are many green patches fringing the shore just close to high-water mark, and there I have found the following members of the Trichoniscidae to be not uncommon:—*Trichoniscus pusillus* (Brandt), *T. pusillus*, var. *violaceus*, *T. pygmaeus*, G. O. Sars, *T. roseus* (Koch), and *Haplophthalmus danicus*, Budde-Lund. Apart from the English localities mentioned above, *T. albidus* has also been taken at Eton and Sunderland*.

* 'The British Woodlice,' p. 26.

EXPLANATION OF PLATE VI.

Fig. 1. First pair of pleopoda of male of *T. albidus*.
Fig. 2. Ditto ditto of *T. sarsi*.
Fig. 3. Second pair of pleopoda of male of *T. albidus*.
Fig. 4. Ditto ditto of *T. sarsi*.
Fig. 5. Seventh pereopod of *T. albidus*.
Fig. 6. Ditto of *T. sarsi*.
Fig. 7. Extremity of last peduncular joint and flagellum of *T. albidus*.

Note.—Figures 2, 4, and 6 have been drawn from specimens sent to me by Professor Sars.

X.—Four new Amazonian Monkeys.
 By OLDFIELD THOMAS.

Callicebus remulus, sp. n.

Allied to *C. donacophilus*, but with light crown and blackish tail.

General colour above of the grizzled greyish brown found in *C. donacophilus* and *ornatus*. Crown clearer grey, the frontal region almost white. Under surface and inner side of limbs to wrists and ankles bright clear rufous, not the muddy brownish rufous of *C. donacophilus*. Hands and feet white—that is, the greyish white called “white” in these monkeys; about the same as in *C. ornatus*. Front surface of forearms greyish brown like body, the rufous not passing round the wrist, but on the hind limbs the grey-brown narrows at the ankles, the rufous of their inner surface showing dorsally on the hallucal side; this tendency is carried further in *C. ornatus*, where the rufous passes right round the wrists and ankles. Tail blackish throughout, the hairs dull yellowish for their basal, hidden, portion, then broadly black, with inconspicuous coppery or rufous tips; at the extreme end of the tail the hairs are wholly dull yellowish or drab.

Skull very much as in *C. donacophilus*.

Dimensions of the type (measured in skin) :—

Head and body 285 mm.; tail 420; hind foot 82.

Skull: greatest length 59; basal length 43; interorbital space 6·3; premolar-molar series 14·7.

Hab. Santarem, Lower Amazon.

Type. Adult female. B.M. no. 76. 6. 19. 1. Collected by Mr. Wickham.

This monkey seems to be a modification of *C. donacophilus* in the direction of the highly ornamented *C. ornatus*, but its blackened tail is different from either. It had been previously referred to the former species, but the good series of that animal recently received from Bolivia has enabled me to correct the mistake.

Callicebus hoffmannsi, sp. n.

A greyish species with light yellowish underside and hoary hands and feet.

General colour of body above about as in *C. donacophilus*, greyish brown with a subdued undertone of rufous, most marked on the loins. Crown grizzled grey, nearly as in *C. egeria*. Cheeks, whole of under surface, and inner side of limbs light yellowish or pale buffy, very different from the strong rufous of these parts in the allied species. Arms and legs grizzled grey like the crown, without brown or rufous suffusion. Hands and feet blackish grizzled with white, the result being a hoary slate-grey. Tail black throughout, the hairs scarcely paler at their bases.

Anterior nares large, widely open, evenly rounded.

Dimensions of the type (measured in skin) :—

Head and body 375 mm.; tail 440; hind foot 91.

Skull : greatest length 65; nasal opening $7\cdot8 \times 6\cdot8$; premolar-molar series 15.

Hab. Urucurituba, Santarem.

Type. Old male. B.M. no. 8. 5. 9. 11. Collected 13th February, 1906, by W. Hoffmanns, after whom I have named the species.

This species is widely different from any hitherto described, as its hoary slaty-grey hands and feet are quite unlike the red, black, or whitish feet found in other species. *C. cinerascens*, Spix, would appear to have similar feet, but its under surface is also grey, and not yellowish. The tail of *C. hoffmannsi* also is even more completely black than that of *C. remulus*, most of the allied species of the genus having this member either reddish or whitish. Nor has any previously known species of the genus a similarly coloured under surface.

Callicebus egeria, sp. n.

General coloration quite as in *C. cupreus*, but the crown of the head, instead of being distinctly more fulvous or ferruginous than the back, is less so, being a clear grizzled grey,

without even the suffusion of rufous which occurs in both species on the back.

Skull distinguished by its extremely narrow interorbital space and nasal opening, which is decidedly less broad than high, the converse being the case in *C. cupreus*.

Dimensions of the type (measured on the skin) :—

Head and body 380 mm. ; tail 430 ; hind foot 84.

Skull : greatest length 63 ; interorbital breadth 5 ; mastoid breadth 37 ; nasal opening $6\cdot5 \times 5$; length of upper premolar-molar series 15·3.

Hab. Teffé, Middle Amazons.

Type. Slightly immature male. B.M. no. 8. 5. 9. 10. Collected 7th June, 1906, by W. Hoffmanns. Another specimen from the same place collected by Mr. H. W. Bates.

The Museum specimens of *C. cupreus*, coming from the Upper Pastasa R., the Ucayali, and the Jurua, all agree in having the crown of the head distinctly more fulvous or reddish than the back, and this agrees with the description by Spix of his *cupreus* (type-locality Peruvian Amazons), while the Ucayali specimens (collected by Bartlett near Sarayacu) may be taken as topotypes of Geoffroy's *discolor*, usually and rightly considered as a synonym of Spix's name.

On the other hand, the specimen obtained by Bates at Ega, often mentioned in literature as being *C. cupreus*, essentially agrees in its greyer crown and narrow mares with that now again obtained in the same district by Mr. Hoffmanns.

In Mr. Hoffmanns's collection there are two examples of *Callicebus caligatus*, Wagn., from Humayta, Rio Madeira, some 200 miles further up the river than the type-locality, Borba. These specimens indicate that *C. castaneoventris*, Gray, may be distinguished from *C. caligatus*, with which it is usually synonymized, by its darker colour and broader interorbital space.

Saimiri madeiræ, sp. n.

Near *S. sciurea*, but the fulvous of the limbs confined to the hands and feet.

Back of the greyish fulvous characteristic of *S. sciurea*. Crown clear grey, of a bluer tone than in *sciurea*, owing to the almost entire absence in it of a yellowish suffusion. Fore limbs from shoulders to wrists clear bluish grey, not suffused with yellowish, the fulvous of the hands not extending up above the wrists (except just a little way along the outer border), in marked contrast to *S. sciurea*, in which the whole

of the forearms are fulvous to the elbows. Hind limbs similarly bluish grey to the ankles, the grey sharply defined at the hips and quite without the yellowish suffusion which in *S. sciurea* renders the thighs not markedly different from the sides of the body. Under surface and inner side of limbs whitish, clearer, less yellow-suffused, and more sharply defined than in *sciurea*. Tail as usual, its underside whitish.

Dimensions of the type (measured in skin) :—

Head and body 350 mm.; tail 41; hind foot 83.

Skull : greatest length 65; basal length 40; zygomatic breadth 42; breadth of brain-case 36; combined length of upper premolars and molars 13·2.

Hab. Humayta, Middle Rio Madeira, about 65° W., 7° 30' S.

Type. Adult male. B.M. no. 8. 5. 9. 6. Original number 36. Collected 17th August, 1906, by W. Hoffmanns. Five specimens, adult and young.

This distinct species is readily recognizable by the marked contrast of its bluish-grey crown, arms, and legs with the yellowish dorsal colour, and especially by the non-extension of the fulvous of the hands above the wrists, this colour extending over the whole of the forearms in *S. sciurea*.

S. boliviensis, found on the extreme upper waters of the same river-system, is like *S. sciurea* in those respects, its special character being its black crown.

XI.—*The Psammomys of the Alluvial Soil of the Nile Delta.*

By OLDFIELD THOMAS.

THE dark fertile soil of the Lower Nile and its delta contrasting so markedly with that of the deserts on each side of it, we might expect that certain of the local animals would be modified in colour to suit it. There is little doubt that this is the cause of the dark colour of the Cairo spiny mouse (*Acomys cahirinus*), slaty-grey all over when other members of the genus are more or less reddish or yellowish above and white below, and I now find the same thing occurs in *Psammomys*.

The genus ranges from Algeria and Tunis to Palestine, and contains four or five species distinguished from each other mainly by size and the development of their bullæ. All are of a sandy desert colour, including the Egyptian *P.s. obesus*, of which the type locality is Alexandria, just on

the borders of the western desert. We owe to the late Dr. J. Anderson topotypical examples of this form.

Now Mr. M. J. Nicoll, of the Giza Zoological Gardens, has sent a series of *Psammomys* from Damietta, on the dark alluvial soil, and these, while agreeing in other respects with the Alexandrian species, are so uniformly darker that they should evidently be recognized as a local subspecies, to which I would assign the name

Psammomys obesus nicolli, subsp. n.

Proportions and essential characters as in *Ps. obesus*, but the general colour above, instead of being sandy, fawn, or buffy, quite dark, as dark as Ridgway's "hair-brown," but not matching that or any other colour owing to its dull yellowish suffusion. Dorsal hairs all broadly tipped with black, partly hiding their buffy or drab subterminal bands. The crown of the head is particularly different from that of *obesus*, as the hairs, buffy subterminally in both, are in the new form broadly tipped with black. Below there is a similar darkening of the general colour, the hairs being more or less tipped with blackish. Ears, hands, and feet dull fawn. Tail buffy on sides and below proximally, its upper surface with a blackish line, of which the hairs lengthen terminally, with a well-marked crest and terminal black tuft, the black extending all round the distal third of the tail.

Dimensions of the type (measured in flesh by collector) :—

Head and body 178 mm.; tail 149; hind foot 38; ear 14.

Skull: greatest length 46·5; basilar length 38; greatest breadth 26·8.

Hab. Damietta, N. Egypt.

Type. Old male. B.M. no. 8.6.21.1. Collected 8 January, 1908, and presented by Mr. M. J. Nicoll. Four specimens.

Mr. Nicoll saw considerable numbers of this animal, all of the same dark colour.

A similar instance of local blackening is given by Merriam * in the case of certain of the mammals found on the black lava-beds of the Little Colorado desert, the contrast in colour between the specimens from the black soil and those of the desert being such that full specific rank is given to an *Onychomys* and a *Pterognathus*, while a *Citellus* from the same place is separated as a subspecies.

* N. American Fauna, No. 3, pp. 59-60 (1890).

XII.—Descriptions of Three new Snakes from Africa.
By G. A. BOULENGER, F.R.S.*Thrasops batesii.*

About 30 small maxillary teeth followed by three large ones. Rostral much broader than deep, visible from above; internasals nearly as long as the praefrontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, as long as or a little shorter than the parietals; loreal longer than deep; one præ- and three postoculars; a single temporal; seven or eight upper labials, fourth and fifth or sixth and sixth entering the eye, last as large as the temporal; five or six lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales smooth, in 13 rows. Ventrals 163–170; anal entire; subcaudals 101–114. Pale brown or pea-green above, with small black spots and larger light spots forming irregular cross-bands; upper lip white, with the sutures between the shields black; lower parts white in front, brown or olive behind, with scattered small black spots.

Total length 1800 mm.; tail 350.

Described from one adult and two young specimens obtained by Mr. G. L. Bates in South Cameroon (Efulen and Akok, Kribi River district, and Ja River district).

HYPOPTOPHIS, gen. nov. (*Colubrid. opisthogl.*).

Maxillary very short, with four teeth gradually increasing in size and followed, after an interspace, by a pair of large grooved fangs situated below the eye; anterior mandibular teeth slightly enlarged. Head small, not distinct from neck; snout much depressed and very prominent; rostral very large, with obtuse horizontal edge, concave below; eye very small, with vertically elliptic pupil; nostril in a semi-divided nasal; no loreal; a præocular in contact with the nasal. Body cylindrical; scales smooth, without pits, in 15 rows; ventrals rounded. Tail short; subcaudals single.

Hypoptophis wilsonii.

Upper part of rostral as long as its distance from the frontal; internasals shorter than the praefrontals; frontal as long as broad, rather more than twice as broad as the supralocular, which is small; two postoculars, in contact with the anterior temporal; temporals 1+1; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are a little longer than the posterior. Ventrals 118; anal entire; subcaudals 36. Uniform blackish brown.

Total length 560 mm.; tail 100.

A single female specimen from Inkongo, on the Sankuru River, in the Kassai Province of the Congo, presented by Mr. H. Wilson.

Atractaspis watsonii.

Snout very short, feebly prominent. Portion of rostral visible from above half as long as its distance from the frontal; suture between the internasals shorter than that between the praefrontals; frontal as long as broad, longer than its distance from the end of the snout, as long as the parietals; one præ- and one postocular; temporals small, 2+3; six upper labials, third and fourth largest, fourth bordering the eye; first lower labial in contact with its fellow behind the symphysial; three lower labials in contact with the chin-shields. Scales in 29 rows. Ventrals 222; anal entire; subcaudals 29, mostly single (last 8 paired). Uniform black.

Total length 570 mm.; tail 45.

A single female specimen from Sokoto, Upper Niger, presented by Mr. C. F. Watson.

XIII.—*New African Phlebotomic Diptera in the British Museum (Natural History).* Part III. *Tabanidae (continued).*
By ERNEST E. AUSTEN *.

TABANINAE.

Genus *Hæmatopota*, Mg. (*continued*).

Hæmatopota copemanii, sp. n.

♀.—Length (15 specimens) 9·5 to 11 mm.; width of head 2·6 to 2·8 mm.; width of front at vertex 1 to 1·2 mm.; length of wing 8·4 to 9·6 mm.

Yellowish grey; dorsum of thorax with four dark brown longitudinal stripes, dorsum of abdomen with a broad longitudinal dark brown stripe on each side of middle line, starting from base and usually becoming attenuated or dying away towards distal extremity, narrowly interrupted on hind margins of segments; frontal callus clove-brown †, sometimes lighter in

* For Parts I. and II. see Ann. & Mag. Nat. Hist. ser. 8, vol. i, pp. 209-228 and 401-428.

† For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).

middle ; wings partly hyaline, with tips and a broad border to hind margin, not quite reaching axillary incision, brown with light markings ; front tibiae dark brown, somewhat incrassate, with an ill-defined pale band near base, middle and hind tibiae ochraceous-buff, without bands, but tips of middle tibiae sometimes brownish.

Head : face, jowls, and central portion of front yellowish grey, sides of front olive-grey ; frontal *callus* narrow, expanding on each side and extending from eye to eye, upper margin straight, produced into an upwardly directed triangle in centre, no dark median spot below *callus* ; lateral frontal spots clove-brown or black, well-marked and conspicuous, not in contact with eyes and each surrounded with a light grey area when seen from above ; median frontal spot inconspicuous or absent ; *palpi* fawn-coloured, terminal joint moderately swollen, blunt at tip, clothed with short black hair ; first and second joints of *antennæ* reddish fawn-coloured, first joint not swollen or elongate, third joint dark brown or reddish brown, lighter at base, narrow and elongate, with upper and lower margins parallel, last three annuli clove-brown, last annulus equal in length to the two preceding annuli taken together. **Thorax** : all four dark brown stripes on dorsum often extending to hind margin, but admedian pair sometimes suddenly becoming faint at one-third of the distance from transverse suture to hind margin ; *scutellum* with a pair of sharply defined dark brown elongate marks (continuations of the outer stripes on the main portion of the mesonotum). **Abdomen** : dorsum and venter clothed with short, appressed, pale chrome-yellow hairs ; dark brown stripes on dorsum converging towards distal extremity, and on seventh segment often in contact, each stripe composed of a series of quadrate blotches (one on each segment), which on the distal segments are usually represented only by their inner and a portion of their posterior margins ; venter with a brown median stripe ; not sharply defined. **Wings** : basal cells entirely, anal cell except distal extremity, hyaline ; discal cell and basal two-thirds of first posterior cell only a little less clear, without markings, or merely with a few faint indications of darker transverse flecks ; marginal cell as far as fork of third vein clear, except for more or less indistinct traces of two or three interrupted or semi-interrupted darker cross-bars ; outer half of rosette round fork of third vein distinct, composed of detached light marks ; light sinuous mark in tip of wing below second longitudinal vein sharply defined, as also its continuation in shape of a series of detached, sometimes semi-oblique light marks.

running across posterior cells parallel to hind margin; remains of lower half of rosette round distal extremity of discal cell and sometimes also those of lower half of rosette round distal extremity of second basal cell visible above this series of marks; anal angle, a rather broad streak across axillary cell a little below the middle, and alula hyaline; stigma clove-brown, elongate, sharply defined and conspicuous. *Halteres* buff or cream-buff, knob seal-brown at base above and below. *Legs*: femora dusky, greyish pollinose; tarsi dark brown, first joint of middle and hind pairs except tip usually lighter (ochraceous buff).

North-western Rhodesia; type and a large number of other specimens from the Kasempa District, January 1908 (*District Commissioner E. A. Copeman*). Mr. Copeman, in whose honour I have much pleasure in naming this species, when forwarding the specimens together with seven others belonging to *Hæmatopota pertinens*, Austen, and two species not yet determined, wrote that these flies are "an awful pest in the early rainy season; their bites cause irritation and swelling, but I have not heard that they carry any known disease-germs."

Hæmatopota copemanii belongs to a group of species, other members of which are *H. similis*, Ricardo, *H. unicolor*, Ricardo, *H. densemamii*, Austen, and *H. laverani*, Surcouf, and to which *H. pertinens*, Austen, is somewhat more distantly allied. From all of those mentioned the new species is distinguished by the absence of the median spot below the frontal callus. It agrees with *H. similis* and *H. densemamii* in the pattern of the wing-markings, but differs from both in the lighter coloration of the pollinose covering of the body, in the light area in the wings being more hyaline (therefore presenting a greater contrast to the dark border, in which the light markings are more sharply defined), and especially in the basal cells being entirely hyaline. *H. copemanii* differs from *H. densemamii* in the frontal callus being less deep, and from *H. similis* in the palpi being more slender and paler. From *H. laverani* (Congo Free State) *H. copemanii* is distinguished by the frontal callus being slightly shallower on each side of the middle line, the light area in the wings and the light wing-markings being more hyaline, the first and second costal cells being darker, and the stigma being distinctly longer and darker. The colour of the frontal callus and the much smaller first joint of the antenna will suffice to distinguish *H. copemanii* from *H. unicolor*, Ricardo.

Hæmatopota masseyi, sp. n.

♀.—Length (1 specimen) 8·5 mm.; width of head 2·5 mm.; width of front at vertex 1 mm.; length of wing 8·2 mm.

Grey; dorsum of thorax French grey, with four olive-coloured longitudinal stripes; abdomen yellowish grey, dorsum with a pair of quadrate dark brown blotches on each segment commencing with second, partly obsolete on fourth segment and almost obsolete on subsequent segments, venter with a very broad dark brown longitudinal stripe extending from base to tip; frontal callus shining black; wings hyaline, except costal cells and a light brown border, which contains light markings and, commencing on costa about 1 mm. before end of second vein, includes tip and extends nearly to anal angle; legs dark brown, under side of hind femora pearl-grey, front tibiae hardly incrassate, with a very indistinct lighter band near base, middle and hind tibiae each with two more or less inconspicuous reddish-brown bands.

Head: front, except vertex, silvery grey when viewed from above, face and jowls yellowish grey, a clove-brown elongate fleck on each side of face, running from lower inner angle of eye to antenna; *frontal callus* of moderate depth, extending from eye to eye, its upper margin straight in middle, then curving downwards on each side, lower margin with a wide median indentation; a narrow clove-brown median fleck below callus reaching to level of anteunæ; lateral frontal spots large, clove-brown, subtriangular, not in contact with eyes, median frontal spot absent in typical specimen; *palpi* mouse-grey, terminal joint elongate, clothed with short yellowish hairs intermixed with some blackish ones; first and second joints of *antennæ* mouse-grey, third joint wanting, first joint short, not incrassate, sparsely clothed above with yellowish hairs. *Thorax:* dorsum sparsely clothed with short yellowish hairs, inner pair of stripes terminating beyond transverse suture at about one-third of distance between latter and hind margin; a narrow stripe above base of each wing and a spot at bottom of mesopleuræ olive-coloured; *scutellum* uniform grey, without spots. *Abdomen* clothed with short appressed yellowish hairs; dark brown blotches on dorsum not extending to hind margins of segments. *Wings:* both basal cells, marginal cell to a distance of nearly 1·2 mm. beyond distal extremity of stigma, basal half of anal cell, and anal angle hyaline; first submarginal cell as far as fork of third vein, first posterior cell to about

same level, and discal cell also hyaline, with exception of a few faint darker clouds along the veins, and in case of discal cell vestiges of two or three faint and interrupted darker transverse markings; light markings in light brown border of tip and hind margin coarse, tending to become confluent; usual sinuous light mark near tip of wing clearly defined, in contact above lower branch of third vein with remains of outer portion of periphery of distal rosette; usual series of oblique light markings running across posterior cells; light flecks on hind margin of wing in distal angles of axillary and second and third posterior cells, faint vestiges of similar flecks in distal angles of fourth and fifth posterior cells; rather more than basal half of axillary cell hyaline, except a faint darkish spot near proximal angle and a broad transverse dark mark, which starts from middle of sixth longitudinal vein and does not reach anal angle; appendix to fork of third vein long; *stigma* long, clove-brown, conspicuous. *Halteres* brownish, knob seal-brown at base above and below. *Legs*: middle and hind tibiae clothed with short, appressed, yellowish hair; first joint of middle and hind tarsi lighter at base.

Congo Free State: Katanga District, valley of the Lualaba River, between 9° and $10^{\circ} 40'$ S. lat., Jan. 1907 (Dr. A. Yale Massey).

I have much pleasure in naming this prettily marked species in honour of its discoverer, who, by his energy as a collector while acting as Medical Officer to Tanganyika Concessions, Ltd., considerably enriched the National Collection, and made many additions to our knowledge of the blood-sucking Diptera of the south-eastern corner of the Congo Free State.

Hematopota masseyi belongs to the same group as the foregoing species; it can be distinguished from all the described species of this group by the large hyaline space in the wing, next the costa and beyond the stigma.

Hematopota divisapex, sp. n.

♀.—Length (3 specimens) 8·25 to 9 mm.; width of head 3 to 3·25 mm.; width of front at vertex 1 mm. to just over 1 mm.; length of wing 8 mm.

Brown; thorax mummy-brown, with grey longitudinal stripes on dorsum; scutellum fawn-coloured, greyish pollinose; abdomen clove-brown, hind margins of segments cream-buff, first and second segments ochraceous-buff on sides and beneath; frontal callus dark mummy-brown; wings dark brown with light

markings and at distal extremity a conspicuous light cross-band, which, starting from costa just beyond end of second longitudinal vein, rejoins margin a little below middle of second submarginal cell, and thus cuts off extreme tip of wing; front and hind legs clove-brown, middle legs seal-brown, front and hind tibiae each with a broad cream-coloured band at base, clothed with silvery hair, middle tibiae with two cream-buff bands.

Head: front yellowish grey, its sides nearly parallel, face and jowls smoke-grey; frontal callus moderately deep, extending from eye to eye, its upper margin convex, lower margin straight, close to base of antennæ; seal-brown median spot below callus very small and inconspicuous, divided; lateral frontal spots rather small but conspicuous, seal-brown, in contact with or narrowly separated from eyes, median frontal spot inconspicuous or absent; palpi cream-buff, terminal joint rather small, tapering, clothed on outer side with short black hairs, at base and below with yellowish hair; first and second joints of antennæ ochraceous-buff, third joint wanting, first joint 0·6 mm. in length, but very slightly incrassate, upper angle of second joint dark brown, strongly produced, first and second joints clothed with black hair. **Thorax:** dorsum, including scutellum, clothed with short yellowish hairs; front and hind margins and stripes smoke-grey, a narrow median stripe reaching hind margin and a pair of broader admedian stripes, latter terminating in a point just beyond transverse suture; hind margin with usual crescentic grey mark on each side of median stripe, with which crescentic marks are in contact; pectus, pleuræ, and sides of dorsum smoke-grey, clothed with whitish hair; scutellum with a faint darker transverse band close to base. **Abdomen:** dorsum with a faintly indicated median grey longitudinal stripe, fourth and following segments each with a pair of more or less distinct small admedian grey spots, sides of segments greyish, clothed like hind margins with yellowish hair; venter greyish pubhoso, clothed with short appressed yellowish hair. **Wings:** usual three rosettes of light markings present, although often more or less broken up into isolated spots; usual sinuous light mark near tip of wing represented by cross-band described above, which broadens out below, and is sometimes nearly straight, sometimes slightly sinuous; stigma distinct, dark seal-brown, with a more or less quadrate brown blotch below it, extending to third longitudinal vein; a more or less quadrate light spot next costa at each end of stigma, distal one sometimes with a dark dot in

centre; hind margin with a series of large, conspicuous, triangular light marks, which respectively occupy distal angles of first, second, third, and fifth posterior cells; a similar but smaller light mark in distal angle of axillary cell; basal half of axillary cell hyaline, marked with a more or less distinct brown spot near base, and more distally with a larger or smaller offshoot from the brown colour in the second basal cell; a series of small oblique light marks running across posterior cells, often broken up into a pair of elongate dots in each cell; discal cell with a pair of narrow transverse light marks, sometimes interrupted, and in addition sometimes with a light spot at one or other extremity, or at both extremities; first submarginal cell with a pair of light marks at base; both basal cells hyaline at base, first basal cell with a transverse light mark in middle, connected along second longitudinal vein with another transverse light mark at commencement of distal third, second basal cell with a transverse light mark at end of basal third and a more or less completely closed light loop close to distal extremity; anal cell semihyaline at base, and with a transverse light mark beyond middle; first and second costal cells and extreme base of wing hyaline; alula hyaline, with a darker centre. *Halteres* primrose-yellow, stalks straw-yellow. *Legs*: front tibiae slightly incrassate; first joints of middle and hind tarsi, except tips, cream-buff.

Congo Free State (Katanga District): three specimens (co-types) from Ruwo, Lualaba River, *circa* 11° S., 26° E., Feb. 1906 (Dr. A. Yale Massey).

The conspicuous light cross-band at the tip of the wing will form a convenient guide to the identification of this species. From *Hæmatopota longa*, Ricardo (Nyasaland and East Africa Protectorates), and another species from Nyasaland, at present undescribed, the wings of which also exhibit an apical cross-band, *H. divisapex* is distinguished at once by the fawn-coloured scutellum. *H. sanguinaria*, Austen (North-western Rhodesia), in which the scutellum is somewhat similar in coloration, has no light cross-band at the tip of the wing, and owing to other characters also, such as the coloration and marking of the legs, cannot be confused with the present species.

Hæmatopota coronata, sp. n.

♀.—Length (3 specimens) 10 to 10·75 mm.; width of head 3·25 to 3·75 mm.; width of front at vertex 1·2 to 1·5 mm.; length of wing 7·5 to 8·75 mm.

Dark brown, with grey markings; wings light brown, with a broad bifurcate light cross-band at the apex, and exceptionally well-marked rosettes. Frontal callus dark mummy-brown. Scutellum smoke-grey at base and beneath, with broad dark brown hind border. Abdomen seal-brown above, with sides, hind borders of segments, and a median stripe and pair of admedian spots on each segment smoke-grey. Legs clove-brown or seal-brown, middle femora fawn-coloured or brownish fawn-coloured, darker at tips; a broad band near to base on front and hind tibiae, a more or less distinct narrow band on distal half of hind tibiae, three bands on middle tibiae (including one at extreme base), and first joints of middle and hind tarsi except tips cream-coloured.

Head: front drab-grey, with an underlying brownish tinge in central region, and a pair of brown admedian flecks on vertex; face and jowls smoke-grey, upper part of face yellowish grey, with a dark brown horizontal mark on each side, running from lower inner margin of eye towards antenna; *frontal callus* relatively narrow or of only moderate depth, extending from eye to eye, upper and lower margins nearly straight or slightly undulate; a seal-brown triangular median spot extending from lower margin of callus to level of upper margin of base of antennæ; median as well as lateral frontal spots conspicuous, clove-brown, lateral frontal spots in contact with eyes when viewed from below, median frontal spot situate on a grey mark like an inverted spear- or arrow-head, base of which extends to vertex; *palpi* greyish buff, clothed with yellowish-white hair, intermixed with minute black hairs on outer side of terminal joint, which is of moderate size, not sharply pointed, but little swollen at base, and slightly dusky on outer side towards tip; first joint of *antennæ* shining clove-brown, greyish buff at base on inner side, elongate and strongly incrassate, with a constriction before the tip, second joint ochraceous buff, small, its upper angle but little produced, third joint dark brown, buff at extreme base, narrow and elongate, last three annuli clove-brown. *Thorax:* pectus, pleuræ, and markings on dorsum as in *H. divisapex*. *Abdomen:* dorsum with sides and hind borders of segments clothed with pale yellowish hair; grey hind border of first segment expanded in middle, where it sometimes assumes a cream-buff tint; median portion of front margin of second segment smoke-grey; median stripe on second segment the broadest, in shape of a forwardly-directed triangle with its apex in contact with front margin, median stripes on following segments also sometimes expanded posteriorly; venter

smoke-grey, dark greyish brown towards tip, hind margins of segments lighter. *Wings*: usual three rosettes each consisting of about three concentric series of light marks, generally alternately expanding and contracting; rosette round fork of third longitudinal vein with an upward prolongation to costa, resulting in an elongate light mark below latter at distal end of stigma; rosette round distal extremities of basal cells abruptly truncated above by second longitudinal vein, beyond which it does not extend, though there is a subquadrate light mark at proximal end of stigma, on and below first longitudinal vein; light marks across bases of basal, anal, and axillary cells similar to those forming half of rosette round distal extremities of basal cells, supposing this rosette to be bisected by a line at right angles to longitudinal axis of wing; inner ramus of broad light cross-band at apex of wing much narrower than cross-band itself, and really consisting of the usual sinuous apical streak; it is continuous below with a series of large light blotches along hind margin of wing, at distal extremities of posterior and axillary cells; a light mark at tip of anal cell; two proximal series of marks forming rosette round distal extremities of basal cells with an extension across anal and axillary cells down to hind margin; discal cell with three more or less complete light streaks across each extremity, the two proximal streaks usually more or less confluent; *stigma* dark seal-brown, rather short but conspicuous; alula infuscated, but with a pale edge. *Halteres*: knob clove-brown, or clove-brown above and below, stalk cream-buff. *Legs*: hind as well as front tibiae incrassate, hind tibiae with fringe of black hair on outer side of dark portion; narrow pale band on distal half of hind tibiae sometimes well marked, sometimes scarcely visible, faint traces of a similar second band in some cases distinguishable on front tibiae also; pale band at base of middle tibiae very narrow, though broader than seal-brown band following it.

Somaliland, June 1905 (*Dr. R. E. Drake-Brockman*): three females of this species, taken in the Ogaden country, Somaliland, between the Webi Shebeli and the Web, in September 1901 (*Dr. E. Brumpt*), are in the Muséum d'Histoire Naturelle, Paris.

Hematopota coronata cannot well be confused with any of its African congeners at present known to me. While in the presence of a bifurcate light mark at the tip of the wing it agrees with *H. decora*, Walk., and *H. bullatifrons*, Austen, the sharply defined and very complete compound rosettes (not to mention other characters) are sufficient to distinguish

it from the former of these species, just as the shape of the frontal callus will prevent it from being mistaken for the latter. *H. ruficornis*, Walk., from S. Africa, which also has a bifurcate light mark at the tip of the wing, has much more diffuse rosettes, the first and third antennal joints of a very different shape, and the pair of pale bands on the hind tibia of equal width. To judge from Loew's figure of the wing, *H. duplicata*, Lw. (Cape Colony), though resembling *H. coronata* in the general appearance of the rosettes, is distinguished by the outer branch of the apical cross-band or sinuous mark being no wider than the inner, instead of quite three times as broad.

Hæmatopota inornata, sp. n.

♀.—Length (3 specimens) 11.5 to 12.3 mm.; width of head 4 to 4.2 mm.; width of front at vertex just over 1 mm.; length of wing 12 mm.

Mummy-brown, wings sepia-coloured, light markings faint.—Frontal callus mummy-brown, or dark sepia; dorsum of thorax with narrow yellowish grey stripes; dorsum of abdomen unicolorous, without spots, but with extreme hind margins of segments chrome-yellow; front and hind femora and middle and hind tibiae and tarsi dark seal-brown, middle femora chocolate-brown or russet-brown, darker at tips, front tibiae and tarsi clove-brown, a single band on front tibiae close to base, two bands on middle and hind tibiae, first joint of middle tarsi except tip and basal half of first joint of hind tarsi buff or cream-buff, lower band on hind tibiae less distinct and narrower than upper.

Head: front, face, and jowls yellowish grey, face and jowls clothed with pale yellowish hair, a large dark brown roughly triangular median blotch on vertex, most distinct when viewed from above or at a low angle from below; frontal callus moderately deep, extending from eye to eye, lower margin straight, upper margin convex or angulate; a conspicuous clove-brown median spot below callus; lateral frontal spots dark seal-brown, conspicuous, in contact with eyes, when viewed from above each surrounded by a buff-yellow ring, median frontal spot distinct, in contact with apex of vertical blotch; palpi buff, terminal joint elongate, blunt at tip, clothed on outer side with black and on under side of base with yellowish hair, basal joint clothed with yellowish hair; first and second joints of antennæ ochraceous-buff, clothed above and on outer side with short black hair, first joint viewed from above expanding from base to middle,

then slightly contracting again, viewed from the side expanding from base almost to tip, upper angle of second joint moderately produced, third joint elongate and tapering, dark brown, basal third dull ochraceous-rufous, last three annuli clove-brown. *Thorax*: dorsum with usual three stripes yellowish grey, median stripe very narrow, admedian stripes interrupted beyond expansions behind transverse suture, but with broader continuations projecting forward from crescentic grey marks on high margin; pectus, pleuræ, and sides of dorsum yellowish grey; tip of *scutellum* smoke-grey. *Abdomen*: second segment paler above; venter yellowish grey, clothed with short appressed yellowish hair. *Wings*: usual three rosettes distinct though faint, each rosette consisting of a single series of marks; sinuous light mark at apex very indistinct, sometimes almost obsolete, extending from below tip of second longitudinal vein to lower branch of third vein, but almost obliterated in second submarginal cell, continued as a series of detached oblique marks across posterior cells, faint light marks sometimes present on hind margin in distal angles of some of the posterior cells; upper portion of rosette round fork of third longitudinal vein extending to costa, sometimes appearing as a small subquadrate light spot at distal end of stigma; discal cell with two light marks across middle, but without light marks at extremities; rosette round tips of basal cells incomplete above and below, its proximal border continued into a zigzag mark running down to hind margin of wing; first basal cell with a transverse light mark just before middle, second basal cell with a similar mark at end of basal third; axillary cell with a semicircular light mark cutting off basal angle; *stigma* mummy-brown or dark brown, elongate, and clearly defined; alula uniformly sepia-coloured. *Halteres* cream-buff, knob brownish at base above and below. *Legs*: front tibiae scarcely incrassate, hind tibiae not incrassate.

Uganda: three specimens (co-types) from Buddu, November 1902 (Dr. C. Christy).

Hæmatopota inornata is most nearly allied to *H. ugandæ*, Ricardo (Ann. & Mag. Nat. Hist. ser. 7, vol. xviii. 1906, p. 105), another Uganda species, from which it may be distinguished *inter alia* by the absence of a dark brown median stripe on the abdomen, by the rosettes on the wings not having lighter centres, and by the absence of a distinct light mark below the costa at the proximal end of the stigma.

Hæmatopota malefica, sp. n.

♀.—Length (2 specimens) 10 mm.; width of head 3·75 to 4 mm.; width of front at vertex 1 mm.; length of wing 10 mm.

Mummy-brown, thorax darker, wings dark brown.—Frontal callus mummy-brown; first joint of antennæ incrassate, cylindrical; dorsum of thorax with three grey stripes of usual type; scutellum grey, with a pair of admedian dark brown blotches at base; hind margins of abdominal segments narrowly greyish buff, dorsum of fourth and following segments with a pair of admedian yellowish grey spots at base; rosettes in wings distinct, each consisting of a single series of light marks; legs as in foregoing species, but lower band on hind tibiae sometimes obsolete or indistinct.

Head yellowish grey; frontal callus of moderate depth, extending from eye to eye, lower margin straight, upper margin rising to a slight angle in centre; a conspicuous clove-brown median spot below callus; lateral frontal spots dark seal-brown, conspicuous, in contact with eyes, median frontal spot prescut but not very distinct, a narrow light grey median stripe extending from it to vertex, separating two elongate brown blotches; palpi cream-buff, clothed with hair as in foregoing species, terminal joint elongate; first and second joints of antennæ russet-brown, clothed with black hair, upper angle of second joint strongly produced, third joint dark brown, lighter at base, of moderate breadth and tapering, last three annuli clove-brown. Thorax: pectus, pleura, and sides of dorsum smoke-grey. Abdomen: greyish buff hind margin of dorsum of second segment sometimes expanded into a median triangle; venter greyish buff, clothed with minute appressed yellowish hairs. Wings as in foregoing species, but light markings, especially series of oblique marks running across posterior cells, showing a tendency to become broken up into spots; sinuous light mark at apex sometimes more distinct, at least as regards its upper portion; light mark at proximal end of stigma distinct and extending to costa; stigma dark mummy-brown, strongly marked, shorter than in *H. inornata*. Halteres buff, knob brown or brownish at base above and below.

Nyasaland Protectorate: type and one other specimen from Zomba Plateau (Sir Alfred Sharpe, K.C.M.G., C.B.).

In coloration and facies the present species is very similar to *H. inornata*, from which, apart from its considerably smaller size, it may be distinguished by the first joint of the antennæ being uniformly swollen almost from the extreme

base, instead of regularly expanding from the base towards the tip, by the third joint being broader at the base and less elongate, and by various differences in the wings, such as the shorter stigma, more distinct light mark at the proximal extremity of the latter, wider opening in the upper margin of the distal rosette, and shorter appendix to the fork of the third longitudinal vein.

Hæmatopota mactans, sp. n.

♀.—Length (8 specimens) 9·6 to 11·5 mm.; width of head 3 to 3·6 mm.; width of front at vertex 1 mm. to just over 1 mm.; length of wing 8 to 9·8 mm.

Seal-brown to clove-brown; dorsum of thorax with smoke-grey markings, scutellum, except a broad hind border (sometimes interrupted in middle line), smoke-grey; dorsum of abdomen with hind margins of all segments and a median stripe on second to sixth segments inclusive drab-grey or smoke-grey, fourth and following segments each with a pair of narrow elongate grey spots extending backwards from front margin but not reaching hind margin; wings mouse-grey, light markings milky, apical sinuous mark bifurcate, stigma dark brown, very conspicuous; legs clove-brown or seal-brown, middle femora except tips lighter, a single band on front tibiae, two bands on middle and hind tibiae, and basal half or two-thirds of first joint of middle and hind tarsi cream or cream-buff.

Head: front, face, and jowls smoke-grey, a narrow dark brown or clove-brown interrupted cross-band on upper part of face beneath antennæ; frontal callus mummy-brown, of median depth, extending from eye to eye, upper and lower margins straight; a small seal-brown A-shaped median mark below callus; median as well as lateral frontal spots conspicuous, clove-brown, lateral spots in contact with eyes; some yellowish-white hairs below each lateral spot, curving downwards over callus; *pupi* isabella-coloured, terminal joint sometimes blackish towards tip on outer side, moderately expanded at base, where it is clothed on outer side with rather long pale yellowish hair, clothed elsewhere on outer side with short black hairs; *antennæ* dark brown, first joint greyish pollinose, paler on inner side at base, and sometimes entirely or almost entirely ochraceous-buff, incrassate (elongate oval when viewed from above), with a well-marked constriction before tip when viewed from outer side, second joint with upper angle moderately produced, third joint of moderate breadth, tapering but not markedly elongate, paler

at extreme base, last three anuli clove-brown. *Thorax*: grey markings on dorsum of usual type, median stripe narrow as far as transverse suture, broader behind, where it appears as a process directed forwards from between inner ends of grey crescentic marks on hind margin, admedian stripes narrow, terminating on each side in a grey triangle behind transverse suture; pectus, pleuræ, and sides of dorsum smoke-grey. *Abdomen*: median stripe on dorsum of second segment broader than that on other segments, in the shape of a triangle with apex directed forwards, not or scarcely reaching front margin; sides of dorsum and venter smoke-grey, clothed with short appressed silvery hairs, ventral surface of third to seventh segments inclusive with a broad clove-brown median blotch clothed with black hair, the blotches together forming a median longitudinal stripe, which is interrupted by the pale hind margins of the segments. *Wings*: extreme base, first and second costal cells, and third costal and marginal cells as far as commencement of stigma milky; rosette round distal extremities of basal cells strongly marked though irregular, with a process from its inner border extending as a zigzag light mark across anal and axillary cells down to hind margin of wing; a large milky blotch occupying distal extremities of axillary and anal cells; a light spot in extreme basal angle of axillary cell, in front of which is an *angulate light mark*, with apex of angle directed away from base of wing; rosettes round fork of third longitudinal vein and distal extremity of discal cell small and often much broken up; against a light background base of upper branch of third vein appears infuscated; *stigma* rather short; dark quadrate blotch below stigma not diminishing in width until it reaches first posterior cell; at distal end of *stigma* a small, more or less complete, semi-quadrate milky loop or elongate curved mark next costa, its proximal extremity continuous below with proximal border of distal rosette; outer ramus of apical sinuous mark sometimes very faintly marked; a series of larger or smaller, more or less conspicuous milky blotches on hind margin, occupying distal angles of first, second, third, and fifth posterior cells; usual series of detached oblique light marks across posterior cells more or less confluent with marginal blotches; discal cell with proximal extremity, a transverse mark at end of proximal third (sometimes connected from proximal extremity), two small spots (sometimes conjoined) at commencement of distal fourth, and in some cases a longitudinal fleck beyond these milky; first basal cell with a distinct transverse mark just before middle, second before tip of wing.

base and a transverse mark at end of proximal third milky. *Halteres* cream-coloured, knob sometimes brownish at base above and below. *Legs*: front tibiae slightly incrassate.

Mozambique, Nyasaland Protectorate, Uganda, Somaliland: type from Wadelai, Nile Province, Uganda, 24. xi. 1904 (*Captain E. D. W. Greig, I.M.S.*); a second specimen from Uganda (*Captain Greig*); one specimen from Somaliland (*Th. Greenfield*); two specimens from Katumbe, N. Nyasa, Nyasaland Protectorate, 6. xii. 1906, and three from Blantyre District, Nyasaland Protectorate, May 1905 (*Dr. J. E. S. Old*). Dr. Old's field-note to one of his specimens from Katumbe is as follows:—"Caught biting cattle: country swampy jungle, with very tall coarse reeds and forest with low trees. Only game seen were bushbuck, waterbuck, and warthog; old spoor of eland plentiful, as also that of buffalo some months old." Through the courtesy of Mons. J. R. M. Surcouf, I have been enabled to examine a series of specimens of this species in the collection of the Muséum d'Histoire Naturelle, Paris, including examples from Mozambique, 1905 (*G. Vasse*), and the bed of the Dakato R., S. Harrar, Ogaden, Somaliland, June 1901 (*Dr. E. Brumpt*).

To judge from Loew's figure ('Dipteren-Fauna Südafrika's,' 1860, taf. i. fig. 26), the pattern of the light markings in the wing of *H. recurrens*, Lw., from Natal, is similar to that exhibited by the present species, although in the former case the rosettes are much less broken up. The degree of affinity between *H. meteorica*, Corti (Somaliland), and *H. mactans* cannot be determined without making an examination of the type of the former, since the wing-markings in this species have not been described or figured; it would appear from Corti's description, however, that *all* the tibiae in *H. meteorica* have two pale bands. From *H. pulchrithorax*, Austen, *H. mactans* can be distinguished, apart from all other characters, by the much narrower basal portion of the third joint of the antennæ, as well as by the absence of any trace of a second pale band on the front tibiae.

Hamatopota stimulans, sp. n.

♂.—Length (4 specimens) 8·6 to 11 mm.; width of entire ^{body} 3 to 3·5 mm.; width of front at vertex 1 mm. to just constricting mm.; length of wing 8·2 to 9·4 mm.
Joint with crown; dorsal of thorax darker than abdomen, with moderate broad longitudinal stripes and usual pair of crescentic ^{margin} smoke-grey; scutellum smoke-grey, with

a roughly triangular brown blotch on each side at base ; dorsum of abdomen with hind borders of all segments, and on second and following segments, as far as sixth segment inclusive, a median stripe and pair of admedian spots drab-grey or smoke-grey, seventh segment with spots but without median stripe ; wings light sepia-coloured, light markings milky, sharply defined though rather coarse, rosettes well-marked, apical sinuous mark indistinctly bifurcate ; legs clove-brown or dark seal-brown, middle femora except tips lighter, a single band on front tibiae near base, two bands on middle and hind tibiae, first joint of middle and hind tarsi except tip, and bases of next three joints buff or cream-buff, band on front tibiae narrow.

Head yellowish grey : frontal callus mummy-brown, narrow, extending from eye to eye, partly divided in middle line by a triangle of yellowish pollinose ground-colour which descends from front, upper margin of callus curved, extremities of callus slightly tapering ; a distinct dark seal-brown median spot below callus ; face with a more or less distinct dark streak on each side, near lower inner margin of each eye, and a very distinct small round black spot below each antenna ; lateral frontal spots clove-brown, conspicuous, not in contact with eyes, median frontal spot small or indistinct ; palpi isabella-coloured, terminal joint rather narrow, elongate, blunt at tip, clothed on outer side with black hair ; first joint of antennæ brownish buff, scarcely swollen, clothed like second joint with black hair, second joint ochraceous buff, its upper angle moderately produced, third joint seal-brown, lighter at base, moderately elongate, last three annuli clove-brown. Thorax : three grey stripes on dorsum of usual type, very slender and parallel to each other, median stripe continuous or practically so, admedian stripes more or less indistinct after triangular expansions beyond transverse suture ; pectus, pleuræ, and sides of dorsum smoke-grey. Abdomen : dorsum with hind borders of segments clothed with yellowish hairs, sides of segments smoke-grey ; venter smoke-grey, clothed with short, appressed, yellowish hairs, a broad dark brown median stripe, interrupted on hind borders of segments, extending from third or fourth segment to tip. Wings : extreme base semi-hyaline ; alula with a pale border all round ; in axillary cell, light loop round proximal angle connected by a broad mark, along or close to hind margin, with extremity of zigzag downward process from proximal rosette ; apical sinuous mark broader at its upper extremity, immediately below tip of second longitudinal vein ; beyond apical sinuous mark two more or less distinct light spots in second submarginal cell just before tip of wing.

representing an incomplete outer branch of apical sinuous mark; a series of usually large and conspicuous light blotches on hind margin in distal angles of all posterior cells (or all except fourth posterior cell), with an additional blotch on distal extremity of sixth longitudinal vein, occupying tips of axillary and anal cells, and proximal marginal angle of fifth posterior cell; usual series of detached oblique light marks across posterior cells distinct; central portion of middle and distal rosettes usually occupied by a series of light spots, surrounding distal extremity of discal cell and fork of third longitudinal vein respectively; *stigma* seal-brown, of moderate length, at its proximal extremity a conspicuous light mark, formed by an upward extension from proximal rosette to costa; discal cell with two transverse light marks, which are sometimes approximate, in its median portion, and a larger or smaller light spot or crescentic mark near its distal extremity, sometimes also with a minute light fleck in its proximal extremity; markings of basal cells as in foregoing species; first costal cell and second costal cell as far as pale mark before stigma lightly infuscated. *Halteres* cream-buff, knob seal-brown at base above and below. *Legs*: front tibiae not or scarcely incrassate, pale band not broader than broadest bands on middle and hind tibiae; middle tibiae sometimes buff at extreme base.

Nyasaland Protectorate, 1907 (*Dr. J. E. S. Old*).

In *facies* and markings this species resembles the South African *Hæmatopota ruficornis*, Walk., from which, however, it can at once be distinguished by the much less deep frontal callus, the narrowness of the band on the front tibiae, and the dark stripe on the venter; from the following species, to which it is also similar in *facies*, *H. stimulans* may be distinguished, *inter alia*, by the shape of the frontal callus, the presence of a distinct median stripe on the dorsum of the majority of the abdominal segments and the smaller size of the admedian spots, and above all by the broad light bar connecting the loop and zigzag mark in the axillary cell.

Hæmatopota insidiatrix, sp. n.

♀.—Length (5 specimens) 8·4 to 10·5 mm.; width of head 3 to 3·6 mm.; width of front at vertex 1 to 1·4 mm.; length of wing 8 to 9·6 mm..

Dark mummy-brown; dorsum of thorax with narrow, longitudinal, smoke-grey stripes, dorsum of abdomen with a double series of large smoke-grey or drab-grey rounded spots; thorax and scutellum as in foregoing species; dorsum of abdomen

~~with hind borders of segments drab-grey or greyish cream-buff, second to sixth segments inclusive each with an ill-defined smoke-grey median stripe, sometimes indistinct or obsolete on segments after the second; wings light sepia-coloured, pale markings similar in pattern to those in wings of foregoing species but less coarse, and loop and zigzag mark in axillary cell not connected; legs as in foregoing species.~~

Head: front drab-grey, vertical region with a more or less distinct sub-triangular brown mark on each side of median line, which is occupied by a narrow grey stripe running from median frontal spot to margin of occiput; face and jowls smoke-grey, area between lower inner margin of eye and antenna on each side generally more or less dotted with mummy-brown, or exhibiting commencement of a horizontal dark brown streak, below each antenna a small dark brown fleck, usually less conspicuous than in foregoing species; *frontal callus* mummy-brown, rather narrow from above downwards, extending from eye to eye, upper margin straight or nearly so, not indented in middle line; a well-marked seal-brown median spot below callus; median as well as lateral clove-brown frontal spots present, latter in contact with or narrowly separated from eyes; *palpi* as in foregoing species, except that terminal joint on outer side, in addition to its covering of black hair, is clothed, chiefly at base and below, with pale yellowish hair; first and second joints of *antennæ* greyish fawn-coloured, clothed with black hair, first joint slightly swollen on inner side, third joint hazel or mummy-brown, moderately elongate, last three annuli dark brown. **Abdomen:** admedian grey spots on dorsal surface of first six segments, sometimes so large as to be confluent and appear as a pair of broad admedian longitudinal grey stripes; venter as in foregoing species, dark median stripe extending from base to tip. **Wings:** light markings sharply defined, except indistinct pale mark in second submarginal cell, beyond apical sinuous mark; light blotches on hind margin smaller than in foregoing species, and usually no light blotch in fourth posterior cell; *stigma* and light mark before it as in previous species; light markings in discal cell as in foregoing species. **Halteres:** as in foregoing species. **Legs:** front tibiæ, in addition to pale band near base, with some pale yellowish hairs in or below middle, representing a rudimentary or vestigial second pale band.

Nyasaland Protectorate: twenty-four miles from Blantyre, 22. i. 1905, 6.0 to 7.0 A.M. (*Dr. J. E. S. Old*). The collector's field-note to this species is the same as that to his specimens

of *H. pertinens*, Austen, taken at the same place and time:—
“In tall green reeds; bit myself and native servant; usually silent and very sluggish.”

Hæmatopota insidiatrix closely resembles the foregoing species (*q. v.* for distinctive characters).

Hæmatopota noxialis, sp. n.

♀.—Length (7 specimens) 8·6 to 11 mm.; width of head 3 to 3·8 mm.; width of front at vertex 1·2 to 1·4 mm.; length of wing 8 to 10 mm.

Dark brown; thorax with smoke-grey markings as in H. stimulans; dorsum of abdomen with hind borders of segments greyish cream-buff, and two admedian rows of large smoke-grey spots, but with no median grey stripe; wings pale mouse-grey, the infuscation uniform throughout, light markings faint though distinct, usual three rosettes and apical sinuous mark present, each rosette composed almost entirely of a single series of lines; legs as in H. stimulans, except that pale band on front tibiae is much broader than bands on middle and hind tibiae, and middle femora are not or scarcely darker at tips.

Head: front yellowish grey, face and jowls smoke-grey, sometimes a brownish mark on each side of face running inwards from lower inner margin of eye, but no conspicuous dark spot or fleck below each antenna; *frontal callus* cinnamon- or raw umber-coloured, of moderate depth, extending from eye to eye, lower margin straight, upper margin generally slightly concave on each side of middle line; dark median spot below callus absent or very small; median as well as lateral clove-brown frontal spots present, latter usually not in contact with eyes; *palpi* as in *H. insidiatrix*; first and second joints of *antennæ* greyish cinnamon-coloured, clothed with black hair, first joint short, more or less incrassate on inner side, third joint russet-brown, last three annuli darker, sometimes clove-brown, basal portion of third joint moderately elongate and tapering. *Thorax:* pectus, pleuræ, and sides of dorsum smoke-grey. *Abdomen:* dorsum with sides of segments smoke-grey, and admedian spots extending from second to seventh segments inclusive; venter as in *H. stimulans*. *Wings:* light markings not coarse; no light blotches along hind margin, but usual series of detached oblique marks across posterior cells present; loop and zigzag mark in axillary cell not connected; markings in discal cell usually confined to two light marks across its median portion, but occasionally a third light fleck faintly indicated near its distal extremity; *stigma* seal-brown, its proximal extremity

occupied by an upward prolongation from proximal rosette. *Halteres* as in *H. stimulans*.

Nyasaland Protectorate: type and five other specimens from the Blantyre District, May 1905 (Dr. J. E. S. Old); an additional specimen forwarded in 1905 by Major F. B. Pearce, with the following note: "Especially virulent species; complained of by natives as injuring, if not actually killing their cattle."

In *facies*, conspicuously spotted abdomen, and the faint colour and markings of the wings, *H. noxialis* agrees with *H. brunneascens*, Ricardo, a species which is common in Uganda, but also occurs in the Nyasaland Protectorate; the new species, however, is distinguished by the shape of the antennæ, and by the absence of a broad mummy-brown bar between the eye and antenna on each side, and of a median grey stripe on the dorsal surface of the abdominal segments. From both *H. stimulans* and *H. insidiatrix* the present species is distinguished at once by the breadth of the pale band on the front tibiae; while it differs from *H. malefica*, apart from the paleness of the wings and other characters, in the wing-markings being much less broken up, the broader front, much shorter first antennal joint, shallower frontal callus, &c.

Hæmatopota furtiva, sp. n.

♀.—Length (4 specimens) 9 to 9·4 mm.; width of head 3 to 3·2 mm.; width of front at vertex just over 1 mm.; length of wing 8 mm.

Dark olive-brown; markings of dorsum of thorax and abdomen olive-grey, as in H. stimulans, Austen, though median stripe on abdominal segments usually broader, and admedian spots generally larger; wings sepia-coloured, light markings closely resembling those exhibited by the wings of H. stimulans, except that loop and zigzag mark in axillary cell are not connected; legs as in H. stimulans, except that middle and hind femora are paler (buff-coloured), that band on front tibiae is paler (cream-coloured) and slightly broader, and that distal two-thirds of front tibiae are distinctly swollen.

Head: front yellowish grey, its sides nearly parallel, face and jowls smoke-grey; frontal callus clove-brown or black, about 0·5 mm. in depth, extending from eye to eye, upper and lower margins straight or nearly so, though upper margin sometimes apparently curves slightly downwards at sides; a dark seal-brown median spot below and in contact with callus; lateral frontal clove-brown spots rather small,

not in contact with eyes, roughly triangular in shape, with their apices pointing downwards and inwards, median frontal spot small, but usually distinct; *palpi* greyish buff or isabella-coloured, terminal joint elongate, blunt at tip, but little expanded at base, clothed on outer side with black hairs, pale hairs confined to under side of first and under side of base of second joint; first and second joints of *antennæ* buff-yellow or orange-buff, clothed with black hair, third joint ochraceous-buff, rather small, terminal annulus clove-brown, first joint of *antennæ* not incrassate, though its inner margin seen from above is slightly convex, third joint narrow, but little wider at base. *Thorax*: median grey stripe on dorsum continuous, very narrow; pectus, pleuræ, and sides of dorsum smoke-grey; *scutellum* smoke-grey, with a more or less distinct dark brown blotch on each basal angle. *Abdomen*: olive-grey spots on dorsum large, roughly circular; venter grey, with a broad clove-brown median stripe except at base, hind margins of segments narrowly cream-buff. *Wings*: apical sinuous mark usually somewhat broader at its upper extremity, immediately below end of second longitudinal vein, indistinctly bifurcate as in *H. stimulans*, or at least the lower of the two light spots beyond it present in the second submarginal cell; discal cell with two transverse light marks, and also usually with a light spot at or near each extremity; *stigma* similar to that in wing of *H. stimulans*, but paler and slightly shorter. *Halteres* as in *H. stimulans*.

Nyasaland Protectorate, 1907 (*Dr. J. E. S. Old*).

A fifth specimen from the Nyasaland Protectorate (*Dr. Old*), probably taken at the same time and place as the foregoing, differs from the typical form in having the frontal callus slightly shallower, owing to its upper margin curving downwards somewhat on each side; since in other respects the specimen agrees with the type it would seem reasonable to suppose that the difference in the shape of the callus is an individual one, and that the specimen really belongs to the present species. Care is necessary to distinguish *H. furtiva* from *H. stimulans*, which it closely resembles in *facies*, but as distinctive characters in the case of the present species it will suffice to note that the frontal callus is clove-brown or black instead of mummy-brown, that it is considerably deeper, does not as a rule taper towards the sides, and is not partly divided in the middle line; that the third joint of the *antennæ* is ochraceous-buff instead of seal-brown (clove-brown in the case of the last three annuli), and is also rather small; and that in the wing the light loop and zigzag

mark in the axillary cell are not connected by a light bar running parallel to the margin of the anal angle.

Hæmatopota nociva, sp. n.

♀.—Length (2 specimens) 8·4 to 8·8 mm.; width of head 2·8 mm.; width of front at vertex 1 mm.; length of wing 7·5 mm.

Dark olive-brown or dark sepia-coloured, dorsum of thorax and abdomen with smoke-grey or drab-grey markings, as in H. furtiva, Austen; frontal callus raw umber-coloured or mummy-brown, of moderate depth, extending from eye to eye; antennæ coloured as in H. furtiva, but first joint strongly incrassate in middle; coloration and markings of wings and legs as in H. furtiva, except that light wing-markings are slightly less coarse, and that stigma is darker seal-brown and somewhat longer; front tibiæ, except basal third, incrassate.

Agreeing with *H. furtiva*, Austen, in practically every respect, except as already indicated and as follows:—lateral frontal spots larger; terminal joint of *pulpi* clothed above with rather long and fine brownish hair; first joint of *antennæ* seen from above strongly incrassate in middle (inner margin strongly convex), tapering again towards tip.

Nyasaland Protectorate: one specimen (type) taken in 1907 (*Dr. J. E. S. Old*); a second specimen from Zomba Plateau (*Sir Alfred Sharpe, K.C.M.G., C.B.*).

Hæmatopota nocens, sp. n.

♀.—Length (2 specimens) 8·6 mm.; width of head 3 mm.; width of front at vertex 1·2 mm.; length of wing 8·2 to 8·6 mm.

Dark-brown; dorsum of thorax with three practically entire smoke-grey stripes; dorsum of abdomen clothed with short appressed pale yellow hairs, markings of dorsum as in H. stimulans, Austen, but yellowish-grey and first segment also with a pair of grey spots or blotches connected with basal angles; frontal callus clove-brown, extending from eye to eye, and deeper towards each side; coloration and markings of wings as in H. noxialis, Austen, except that light mark at proximal end of stigma is somewhat more distinct; legs as in H. furtiva, Austen, except that pale band on front tibiæ is somewhat less sharply marked, and that distal portion of front tibiæ is scarcely or not at all swollen.

Head: front yellowish-grey, face and jowls smoke-grey, a more or less distinct trace of a mummy-brown mark between antenna and lower inner margin of eye on each

side; *frontal callus* fairly deep on each side, narrowing towards middle line, where it is distinctly constricted; dark seal-brown median spot below callus present; *lateral frontal clove-brown spots small, widely separated from eyes*, median frontal spot very small or obsolete; *palpi* isabella-coloured, terminal joint moderately slender, thickly clothed on outer side with black hairs, and with some pale yellowish hairs on under side of basal half; *antennæ* russet-brown, terminal annulus of third joint darker, first joint somewhat short, slightly swollen, with convex inner margin when viewed from above, third joint only slightly expanded towards base. *Thorax*: pleuræ, pectus, and sides of dorsum smoke-grey; *scutellum* smoke-grey, with a dark brown blotch on each side. *Abdomen*: venter as in *H. stimulans*, Austen. *Halteres* as in *H. stimulans*.

Nyasaland Protectorate, 1907 (Dr. J. E. S. Old).

Care is necessary in order not to confuse *H. nocens* with one or other of the two foregoing species, to both of which it presents a superficial resemblance, although from both it may be distinguished by the finer and less complex light markings of the wings; other points of difference from *H. furtiva* are furnished by the shape of the frontal callus, and the browner and more incrassate first joint of the antennæ; from *H. nocira* the present species may further be distinguished by the shape and coloration of the frontal callus and first joint of the antennæ; from *H. noxialis*, Austen, which, as already stated, it closely resembles in the coloration and markings of the wings, *H. nocens* may be distinguished, *inter alia*, by the coloration and shape of the frontal callus, and the presence of a median stripe on the dorsum of all the abdominal segments except the first and last.

XIV.—*Remarks on the Hymenopterous Genus Tiphia.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

ASHMEAD (Canadian Entomologist, 1900 and 1903) forms a family Tiphidae to include the genera *Tiphia*, *Paratiphia*, *Epomidiopteron*, *Pterombrus*, and *Engycystus*. While agreeing with him as to the points distinguishing the group from the true Scoliidae being of more than generic importance, I do not think he is justified in making more than a subfamily for it. I also differ from him in his remarks on *Pterombrus* and *Engycystus*. The differences which he gives between

the two genera are not very important on his own showing, and they certainly are not quite accurate; the cubitus in the hind wing of the male of *Engycystus rufiventris*, Cress., can hardly be said to be interstitial with the transverse median nervure, though distinctly nearer to it than in *Pterombrus confusus*, Sm. The hind tibiae of the female *Pterombrus ænigmaticus*, Sm., are serrate, though not strongly. As far as I can see there is absolutely no justification for treating *Pterombrus* and *Engycystus* as separate genera. Ashmead, however, had not seen specimens of *Pterombrus*. He also states that he has examined both sexes of *E. rufiventris* and finds them true Tiphidiids; but he makes absolutely no mention of important points of difference. The intermediate coxae of *Pterombrus ænigmaticus* ♀ are contiguous, not widely separated as in *Tiphia*; the radial cell is closed, and there are three complete cubital cells; the antennæ also are very different. In the male the intermediate coxae are almost, though not quite, contiguous, the neuration of the fore wing resembles that of the female, and the aculeus of the hypopygium is long and recurved as in *Myzine*, and very much longer than in *Tiphia*. Ashmead gives as one of the characters of his Tiphidiæ, "pygidium in ♂ entire." For *Tiphia* this is correct, but in *Pterombrus*, though not deeply slit as in *Myzine*, it certainly seems to me to be distinctly emarginate in the middle of the apical margin. The points in which an approach to *Tiphia* may be noticed are the entire eyes and the development of the stigma. I only know the female of *E. rufiventris* by Fox's figure and description, which are quite sufficient to show the identity of the genus with *Pterombrus*. In my opinion the male of *Pterombrus* is distinctly nearer to *Plesia* than to *Tiphia*; whilst the female shows many important points of distinction from both. Ashmead suggests that *Engycystus* is closely allied to *Epomidiopteron*, which he classes in his Tiphidiæ, as I think rightly, in spite of the absence of a recurved spine on the hypopygium of the male. But the difference between the two genera is very great, and I gather from his remarks that he had not seen specimens of *Epomidiopteron*.

In his classification of his family Cosilidæ in the same paper, Ashmead also seems to me to fall into many mistakes, probably for want of sufficient material. The intermediae coxae are not, as he states, contiguous, or nearly so, in the females especially they are widely separated, though not quite as widely as in *Tiphia*. He places *Dimorphoptera* in his family *Myzinidæ* and *Anthobosca* in the *Thynnidae*, though *Anthobosca* is really the male sex of both *Callosila*,

Sauss., and *Dimorphoptera*, both of which I have treated in former papers as synonyms of *Cosila*, sinking all three names under *Anthobosca*. I follow Sichel and Saussure in regarding the group as a link between *Myzine* and *Scolia*, though also showing some affinities with the Thynnidae. The other genera placed by Ashmead in the Cosilidae seem to me to be of very doubtful affinities, but I have not seen specimens of *Sierolomorpha*, *Dicrogenium*, *Nursea*, or *Isotiphia*. *Maurillus*, Sm., seems to me to be rightly placed by Smith in the Pompilidae, the mandibles being the only feature in which it resembles the groups allied to *Scolia*. *Fedtschenkia*, like *Pterombrus*, is a very distinct genus, which does not fall conveniently into any group, but is probably better placed as a subfamily of the Mutilidae, as is done by André. I have only seen the male, but Ashmead places it with the Cosilidae only because the female is winged. The male agrees with *Anthobosca* in the total or almost complete absence of the transverse depression between the first and second ventral segments, a character by which *Anthobosca* may be at once separated from *Myzine* or *Tiphia*, as well as in the unarmed hypopygium. The former character is shared with many of the Thynnidae, especially in the female sex. Ashmead's key to the classification of his family Myzinidae ('Canadian Entomologist,' 1903) is very confused, the characters for the females being in several cases given under the heading "males." He is, however, probably correct in placing *Pacilotiphia*, Cam., in the family.

Tiphia compressa, Sm.

ff.

c' ♀. The type is from China; Indian specimens have the anterior wings fusco-violaceous, and the intermediate and posterior femora and trochanters wholly ferruginous; there is also an oblique carina on each side on the dorsal surface of the median segment, reaching from the base, where it is about as far from the outer of the central carinae as that is from the median carina, to within a short distance of the apical angle of the segment; this carina is only faintly indicated in the type.

♂. Clypeus rather finely and closely punctured, shallowly and broadly emarginate at the apex; head shining, the front closely and rather finely, the vertex and the space round the ocelli very sparsely punctured; the scape finely and closely punctured, with a few rather short, pale fulvous hairs beneath. Pronotum shining, sparsely and rather finely punctured, the posterior margin broadly smooth; the propleurae smooth and

shining, the mesopleurae finely and rather sparsely punctured. Mesonotum and scutellum rather sparsely punctured, the tegulae smooth and shining. Median segment short, very broadly emarginate at the apex, subopaque, the median carina reaching the apex, with one on each side of it, the last two converging towards the apex, where they are separated by a distance equal to about two-thirds of that which separates them at the base; there is also a more obscure carina on each side, rather less oblique than in the female, and reaching the apical margin at a distance from the apical angle equal to that by which the two outer carinae of the median series are separated from each other on the apical margin, the space between the carinae very finely rugulose; the surface of the posterior truncation slightly concave, smooth and shining; the sides of the segment are coarsely striated. Abdomen shining, the two basal segments and the base of the third smooth, the apex of the third and the whole of the remaining segments finely and closely punctured and clothed at the sides with fulvous pubescence, the basal segment with a deep, longitudinally-striated transverse sulcus near the apex; a similar but deeper sulcus at the base of the second segment. The transverse median nervure is received very distinctly behind the transverse basal nervure; the recurrent nervure is received near the apex of the second cubital cell.

Black; the mandibles at the apex, the palpi, the apex of the femora, and the anterior tarsi fusco-ferruginous. Wings very light fusco-hyaline, hyaline at the base; nervures fuscous, the stigma black.

Length 7 mm.

Hab. Maymyo, Burma, 3000 ft. (*Bingham*), ♂ ♀ *in cop.*; Shillong, Assam, 6000 ft. (*Turner*).

T. clavinervia, Cam. Ann. & Mag. Nat. Hist. (7) xiii. p. 281, 1904, ♂, is extremely near to this species and may prove to be a synonym, but as there are slight differences in the sculpture and neuration it is better not to sink the name until more specimens are available. The carina on the first ventral segment is the same in both species. *Tiphia robusta*, Cam., will probably prove to be a variety of the female; specimens from Lower Burma and Siam, which I refer to *compressa*, are without the lateral dorsal carinae on the median segment and show only the three usual carinae on the middle.

Tiphia rufipes, Sm.

A specimen from Ceylon in the British Museum has the

legs and antennæ black, the stigma is also black and rather longer, and the nervures fuscous. Otherwise, except for the rather longer and narrower shape of the stigma, it does not seem to differ from the type. Specimens from Lower Burma have the antennæ and nervures dark, but the legs are red as in the type. The species is easily distinguished by the very large stigma, which is as large as in many of the males of the genus. The type apparently came from Northern India.

Tiphia auripennis, Bingh.

Tiphia auripennis, Bingh. Fauna Brit. India, Hym. i. p. 64 (1897), ♀.

Tiphia curvinervis, Cam. Entomologist, p. 238 (1902), ♀.

Tiphia fulvinervis, Cam. Ann. & Mag. Nat. Hist. (7) xiii. p. 286 (1904), ♀.

Cameron states that *sulcinervis* is quite distinct from *auripennis*, but does not say how it differs, and I fail to find any difference of specific importance.

Tiphia persica, sp. n.

♀. Clypeus short, truncate at the apex, sparsely punctured, the apical margin smooth. Head shining, sparsely punctured, very sparsely behind the ocelli ; scape finely and closely punctured, with long golden hairs beneath ; the head is rather large and strongly rounded posteriorly. Pronotum deeply but rather sparsely punctured, broadly smooth and shining posteriorly, the surface of the anterior truncation finely and closely punctured ; propleurae striated, very obscurely at the summit, more strongly below ; mesopleurae sparsely punctured. Mesonotum almost smooth on the sides, deeply punctured in the middle, the tegulae smooth. Scutellum sparsely, but deeply, punctured, the centre almost smooth ; the postscutellum finely and sparsely punctured. Median segment subopaque, finely rugulose, almost smooth and shining near the apical angles, the three longitudinal carinae parallel and all reaching to the apex, the surface of the posterior truncation shallowly punctured, the sides of the segment closely striated. Abdomen closely and rather finely punctured, more sparsely and deeply on the two basal segments, the four apical segments much more finely punctured at the base than at the apex, all the segments narrowly smooth on the apical margin, the epipygium coarsely punctured-rugose in the middle. The second recurrent nervure is received by the second cubital cell at about two-thirds from the base ; the second transverse cubital nervure is oblique, strongly curved outwards on the upper half.

Black, with white pubescence ; the mandibles and the

antennæ beneath fuscous : the apex of the pygidium and the spines of the tibiæ and tarsi testaceous brown. Wings very pale flavo-hyaline, nervures and stigma dark ferruginous.

Length 13–16 mm.

Hab. "K. Sefid," S.W. Persia (*Escalera*).

Described from six specimens in the B.M.

Near *T. auripennis*, Bingh., but differs in the larger and more rounded head and the more closely punctured abdomen, also in the paler colour of the wings. Also near *T. fulvipennis*, Sm., but that species has a faint transverse carina on the first abdominal segment.

Tiphia himalayensis, Cam.

Tiphia himalayensis, Cam. Ann. & Mag. Nat. Hist. (7) xiii. p. 282 (1904), ♀.

Tiphia fumipennis, Magr., var. *a*, Ann. Mus. Civ. Genova, (2^a) xii. p. 52 (1892) (nec Smith); Bingh. Fauna Brit. India, Hym. i. p. 58 (1897).

T. fumipennis, Sm., from Borneo has the median segment much longer than in continental specimens and the epipygium is punctured, not striated. *Tiphia rothneyi*, Cam. Ann. & Mag. Nat. Hist. (7) xi. p. 324 (1903), ♀, will probably prove to be the same species as *T. himalayensis*, being distinguished only by the sculpture of the pleuræ, but until more specimens are available it is better to keep them separate. I have seen specimens of *T. himalayensis* from Sikkim and Assam and find considerable variation in the development of the sculpture on the pro- and mesopleuræ, but the sides of the median segment are striated in all the specimens I have seen, not closely punctured as in *T. rothneyi*.

Tiphia tibetana, sp. n.

♀. Clypeus slightly produced and truncate at the apex, finely and closely punctured, the apical margin smooth and shining. Head sparsely, but rather deeply, punctured, with very sparse grey pubescence ; the scape shining, sparsely punctured; with a few long grey hairs beneath. Pronotum very sparsely punctured, the posterior margin very broadly smooth and shining, the propleuræ smooth and shining, delicately striated near the lower posterior angle ; the mesopleuræ coarsely, but rather sparsely, punctured. Mesonotum sparsely punctured, almost smooth on the sides, the tegulæ smooth. Scutellum smooth, with a row of punctures at the apex, the postscutellum almost smooth. Median segment subopaque and finely aciculate, shining near the apical

angles, the three longitudinal carinæ parallel, the median one not nearly reaching the apex, the surface of the posterior truncation shining and almost smooth, with a median carina on the apical half and slightly concave, the sides of the segment coarsely striated. Abdomen shining, sparsely and shallowly punctured, most sparsely on the two basal segments; the basal segment rather slender, rounded anteriorly, the sides of the segments thinly clothed with grey pubescence. Epipygium strongly punctured at the base, the punctures confluent longitudinally, broadly smooth at the apex. The second recurrent nervure is received close to the middle of the second cubital cell.

Black; the mandibles at the apex fusco-ferruginous; the apex of the pygidium and the spines of the tibiae and tarsi dark testaceous, the antennæ beneath fuscous. Wings fusco-hyaline, nervures dark brown.

Length 12 mm.

♂. Clypeus finely and closely punctured, the extreme apex smooth and shining and narrowly truncate, rather closely covered with cinereous pubescence. Head finely and closely punctured, most sparsely round the ocelli. Pronotum finely and rather sparsely punctured, the posterior margin very broadly smooth and shining; the propleuræ smooth and shining, the mesopleuræ shallowly and rather closely punctured. Mesonotum sparsely, but deeply, punctured; scutellum and postscutellum sparsely punctured. Median segment subopaque, punctured-rugulose, the three longitudinal carinæ parallel, the median one not reaching much more than halfway to the apex, the sides of the segment striated. Abdomen shining, sparsely punctured, most sparsely on the two basal segments; the basal segment long and slender, with a small tubercular prominence on each side near the base. The radial cell extends beyond the second cubital cell, which receives the second recurrent nervure at the middle.

Black; the spines of the tibiae and tarsi testaceous. Wings hyaline, iridescent, nervures black.

Length 8-9 mm.

Hab. Gyantse, Tibet, 13,000 ft. (H. J. Walton).

Type in B. M. Described from 4 ♂ and 4 ♀.

Very near *simlaensis*, Cam., but the first abdominal segment is much more elongate in both sexes, it is more sparsely punctured, and the shape of the anterior margin of the clypeus is different in the male.

Tiphia intrudens, Sin.

I can see no important distinctions in specimens of this wide-ranging species from most distant localities; females of the Indian form of the species usually have the second cubital cell rather longer, and the pubescence on the abdomen in a pair taken by me in Assam (6000 ft.) is closer and of a distinctly fulvous colour in both sexes.

Hab. Mysol (*Wallace*); Mackay and Cairns, Q. (*Turner*); Burma; Assam (*Bingham*).

This is the only species of the genus known to occur in Australia. The specimens from Queensland have the median segment shorter in the female and the wings paler in both sexes than in the typical form, clear hyaline in the male. I propose the name *T. intrudens*, st. *brevior*, st. n., for the Australian form.

Tiphia annandalei, sp. n.

♀. Clypeus truncate at the apex, closely punctured at the base, the apex smooth and depressed. Head punctured, but not very deeply or closely, the space round the base of the antennæ very minutely and closely punctured; the posterior ocelli twice as far from the eyes as from each other. Scape finely and closely punctured, with long pale fulvous hairs beneath and a few shorter hairs above, the two basal joints of the flagellum shining and sparsely punctured. Pronotum closely punctured on the anterior third, the posterior two-thirds smooth and shining; the anterior slope rather closely punctured, smooth in the middle; the propleurae rather deeply punctured at the margins, shining and almost smooth, with very fine and almost obsolete striæ, a row of deep punctures a little before the posterior margin; the mesopleurae shining and very sparsely punctured. Mesonotum and scutellum very sparsely punctured, a curved row of deep punctures close to the posterior angles of the scutellum, the tegulae subopaque, shining at the apex. Median segment slightly convex, nearly as long as broad, subopaque and finely aciculated, smooth and shining at the posterior angles, the three longitudinal carinæ parallel and all reaching the apex. Abdomen shining and punctured, the two basal segments very sparsely, the third and fourth more closely at the base, the four basal segments with a transverse row of punctures before the apical margin; the fifth segment deeply and closely punctured; the pygidium rugose at the base, the apical half with eight or nine broad but not very strongly elevated longitudinal carinæ, those in the middle more

obscure; the sides of the segments with long, sparse, grey pubescence slightly tinged with fulvous. The first recurrent nervure is slightly curved outwardly close to the top, the second is oblique and is received beyond two-thirds from the base of the second cubital cell.

Black; the extreme apex of the pygidium and the spines of the tibiæ and tarsi obscurely ferruginous. Wings fuscous-hyaline, tinted with yellow; nervures black.

Length 20 mm., exp. 29 mm.

Hab. Semangko, Selangor, 3500 ft. (*Annandale*); October.

Nearest to *T. fulvinervia*, Cam., from Northern India, from which it differs in the puncturation of the head and abdomen, in the colour of the wings and nervures, and the absence of long fulvous hairs on the head and thorax. It is also allied to *T. fumipennis*, Sm., under which name it is recorded by Colonel Bingham, *Fascic. Malay.*, Zool. i. App., but differs markedly in the sculpture of the pygidium and the greater breadth of the head.

Tiphia clypealis, Cam.

Tiphia clypealis, Cam. Mem. Manchester Lit. & Phil. Soc. xli. no. 4, p. 47 (1897), ♂ (as ♀).

Tiphia flavipennis, Bingham. Fauna Brit. India, Hym. i. p. 59 (1897), ♂ ♀ (nec Smith).

Tiphia quinquecarinata, Cam. Ann. & Mag. Nat. Hist. (7) xiii. p. 288 (1904), ♀.

Bingham's description of *T. flavipennis* is taken from a specimen from Borneo which differs from continental specimens in the much longer median segment and the shape of the anterior margin of the clypeus. Cameron describes *T. clypealis* as a female, but the type in Rothney's collection is a male to which the description corresponds. *Tiphia lyrata*, Magr. Ann. Mus. Civ. Genova, (2^o) xii. p. 252, 1892, ♀, may prove to be a form of this species, but, as Magretti regards it distinct from specimens identified by him as *T. flavipennis* which doubtless belong to the present species, I prefer not to treat the two forms as identical.

Tiphia polycarinata, Magr.

Tiphia polycarinata, Magr. Ann. Mus. Civ. Genova, (2^o) xii. p. 250 (1892), ♀.

Tiphia conscia, Nurse, Journ. Bombay Nat. Hist. Soc. xiv. p. 81 (1902), ♀.

Tiphia erythrocerata, Cam. Mem. Manchester Lit. & Phil. Soc. xli. p. 50 (1897), ♀ (?)

This is a wide-ranging species and will probably be found

to spread over the whole of India and Burma. *T. erythrocerata*, Cam., from Masuri, has only three carinæ on the median segment and may perhaps prove to be distinct, but as the development of the intermediate carinæ shows a good deal of variation, I think it will probably prove to be at most a local variety.

Tiphia decrescens, Walker.

Tiphia decrescens, Walk. Ann. & Mag. Nat. Hist. (3) iv. p. 376 (1859)
♂ (as ♀).

Tiphia nervosa, Nurse, Journ. Bombay Nat. Hist. Soc. xiv. p. 81
(1902), ♂.

Tiphia sub ♂ (lævigata), Magr. Ann. Mus. Civ. Genova, (2^a) xii.
p. 254 (1892), ♂.

This will probably prove to be the male of *T. polycarinata* as Nurse suggests. Walker's type is from Ceylon, and agrees well with a specimen from Burma. The stigma is almost black in the type of *decrescens* and ferruginous in *nervosa*, but other specimens show intermediate gradations. The stigma is said by Magretti to be small, but in specimens I have seen it is rather large.

Tiphia fulvicornis, sp. n.

♀. Clypeus narrowly truncate at the apex, finely punctured at the base, broadly smooth at the apex. Head shining, closely but not very deeply or coarsely punctured on the front, more sparsely on the vertex and round the ocelli. Antennæ inserted twice as far from the eyes as from each other; the scape shining, finely and closely punctured above, with pale fulvous hairs beneath, the second joint of the flagellum very slightly longer than the first, the third half as long again as the second. Pronotum rather sparsely punctured, the posterior margin smooth, the propleuræ smooth and shining, very finely and obscurely longitudinally striated on the lower margin; mesopleuræ rather sparsely punctured; scutellum shining, sparsely punctured, with a very fine, obscure, longitudinal sulcus in the middle. Median segment opaque, coriaceous, smooth and shining at the posterior angles, rectangular, nearly half as broad again as long, moderately convex in the middle, the lateral and posterior margins slightly raised, forming fine carinæ; the posterior truncation almost vertical, shining and very finely aciculated; the three longitudinal carinæ on the dorsal surface parallel, not very near together, the median one not quite reaching the apex. Abdomen shining, rather finely punctured, much more sparsely on the two basal segments than on the others,

the first segment broadly transversely depressed on the apical margin, the epipygium very broadly rounded at the apex, coarsely punctured, the punctures confluent longitudinally, the apical margin broadly smooth. The radial cell is entirely open at the apex. The sides of the median segment are obliquely striated.

Black; with white pubescence on the legs and the sides of the abdomen; the mandibles, the apex of the clypeus, the apex of the scape, the first joint of the flagellum, the tegulae, the apex of the pygidium, and the spines of the tibiae and tarsi fusco-ferruginous; the flagellum from the second joint orange. Wings dark fusco-violaceous, the posterior pair paler and without the strong purple gloss; nervures black.

Length 14 mm., exp. 23 mm.

Hab. Damaraland.

Type in Oxford University Museum, ex coll. Saunders.

Tiphia monomatapa, sp. n.

♀. Clypeus finely and closely punctured at the base, the apical margin transverse, broadly smooth and shining. Scape closely and finely punctured, with long fulvous hairs beneath, the first two joints of the flagellum and the apex of the third shining, the remainder of the flagellum opaque and very finely pubescent. Head closely and rather coarsely punctured, more sparsely on the front below the anterior ocellus. Pronotum closely and rather strongly punctured, the posterior margin broadly smooth; the propleurae punctured anteriorly, almost smooth and shining at the margins posteriorly; the mesopleurae closely and coarsely punctured. Mesonotum very coarsely but sparsely punctured, the scutellum more finely punctured. Median segment slightly convex above, much broader than long, subopaque, exceedingly delicately punctured-striate, the posterior truncation very slightly concave, the margins raised; the dorsal surface with the usual three longitudinal carinae, the central carina not quite reaching the apex, the two outer carinae twice as far apart at the base as at the apex; the sides of the segment finely obliquely striated. Tegulae very large, finely and closely punctured, smooth at the extreme base and apex. Abdomen rather strongly punctured, most sparsely on the basal segment, most closely on the apical half of segments 3-5; the pygidium longitudinally rugose, the apex very broadly finely punctured, with an obscure median carina. Two cubital cells, the division of the first faintly indicated on the radial nervure, the stigma very small.

Black ; the mandibles, the scape of the antennæ at the apex, the flagellum more distinctly beneath than above, the apex of the femora, the spines of the tibiæ and tarsi, and the extreme apex of the pygidium fusco-ferruginous ; the extreme apex of the pronotum, of the tegulæ, and of the abdominal segments testaceous ; the pubescence whitish. Wings hyaline, very faintly tinged with yellowish brown, most strongly in the radial cell ; nervures fusco-ferruginous.

Length 13 mm.

Hab. Salisbury, Mashonaland (*G. A. K. Marshall*) ; February.

Near *T. natalensis*, Sm., from which it may be distinguished by the longer tegulæ, the smaller stigma, the sculpture of the median segment, and the less marked constriction of the apex of the first abdominal segment.

Tiphia scabrosa, Gerst.

Tiphia scabrosa, Gerst. Monatsber. kön. Akad. Wiss. Berlin, p. 512 (1857), ♀.

Tiphia rugosa, Sm. Descr. N. Sp. Hym. p. 185. n. 4 (1897), ♀.

Hab. Inhambane (*Peters*) ; Zululand (*Smith*).

Tiphia abrupta, sp. n.

♀. Clypeus very delicately punctured ; the head rather coarsely, but not very closely punctured, least closely round the ocelli. Pronotum rather coarsely and very closely punctured, the posterior margin narrowly smooth and shining ; the propleuræ finely striated, smooth and shining at the summit ; the mesopleuræ closely, but not very coarsely punctured ; mesonotum and scutellum punctured, the punctures larger and more scattered than on the pronotum. Median segment short and broad, opaque and finely rugulose, the median carina reaching the apex, the two outer carinæ rather far apart, converging slightly towards the apex, the distance between them at the apex about three-quarters of that at the base ; the sides of the segment obliquely striated. Tegulæ closely punctured, the extreme apex smooth and shining. Abdomen shining, closely punctured, the two basal segments a little more sparsely than the others, the basal segment very abruptly truncate at the base, rather strongly constricted at the apex, the apical margin of all the segments very narrowly smooth. Epipygium longitudinally punctured rugose, the apex broadly smooth and shining. The stigma is large and the radial cell very broad.

Black, with whitish pubescence ; the mandibles and the

intermediate tibiæ dark fusco-ferruginous; the antennæ, anterior tibiæ and tarsi, intermediate tarsi, and the apex of the pygidium dark ferruginous. Wings flavo-hyaline, nervures ferruginous, the stigma fuscous.

Length 9 mm.

Hab. Salisbury, Mashonaland (*G. A. K. Marshall*); December.

Very near *T. pedestris*, Gerst., but in that species the abdomen is almost smooth; the colour is also different. The present species has a fine transverse carina at the base of the first abdominal segment above the anterior truncation, which is not mentioned by Gerstaeker in his description of *T. pedestris*.

Tiphia brevipennis, Luc.

Tiphia brevipennis, Luc. Explor. scient. de l'Algérie, iv. p. 285, pl. 15. fig. 9 (1846), ♀ (nec Cameron).

Pseudotiphia brevipennis, Ashm. Cam. Ent. xxxv. p. 6 (1903), ♀.

Ashmead makes a new genus for this species and places it in his family Myziniidæ, but without giving any reason for the change. The shortened and useless wings and the smaller eyes seem to be the only characters distinguishing the species from *Tiphia*, and unless the male when discovered also shows distinguishing features, which is not very probable, I do not consider the formation of a new genus necessary, much less the removal into a different family. *Tiphia brevipennis*, Cam. from Barrackpore is quite a different species and will have to receive a new name, so I propose the name *Tiphia petri* for that species.

Tiphia meridionalis, sp. n.

♀. Head closely and rather deeply punctured, most closely on the front, most sparsely round the ocelli; the scape punctured, with long hairs beneath and a few shorter hairs above, scarcely exceeding in length the second and third joints of the flagellum combined. Pronotum rather closely punctured anteriorly, the posterior half smooth and shining, the face of the anterior truncation finely and rather sparsely punctured; the propleuræ smooth and shining at the summit, striated below; mesopleuræ rather strongly but not very closely punctured; mesonotum sparsely punctured, most closely on the middle, the tegulæ smooth and shining, the scutellum very sparsely punctured. Median segment shining, very minutely punctured, nearly twice as broad as long in the middle, a little depressed posteriorly before the base of the truncation, the three carinæ parallel and rather

far apart, the sides of the segment strongly striated. Abdomen shining, the two basal segments sparsely punctured, the third and fourth more finely and closely punctured at the base, sparsely at the apex, the fifth closely and rather finely punctured, the epipygium punctured rugose at the base, the apical half smooth. The stigma is about twice as long as broad, obliquely truncate at the apex, the lower margin straight, not rounded.

Black; the flagellum fusco-ferruginous, paler at the apex; the spines of the tibiæ fuscous, those of the tarsi paler; the apex of the abdominal segments and of the pronotum very narrowly pale testaceous, the apex of the pygidium narrowly ferruginous. Wings hyaline, clouded in the radial cell, nervures fusco-ferruginous, the stigma fuscous. Pubescence whitish. Mandibles fusco-ferruginous.

Length 12 mm.

Hab. Argentina (*Burmister*). Type in B. M.

Very near *T. azteca*, Cam., from Mexico, but in that insect the head is rather larger and broader, the posterior ocelli nearer together, the scape of the antennæ a little longer, and the stigma much narrower. The punctures in *T. azteca* are larger and not so close.

Tiphia elongata, sp. n.

♀. Clypeus finely punctured at the base, broadly smooth and shining at the apex; the apical margin shallowly and rather widely emarginate in the middle. Front coarsely, but not very closely punctured, the vertex and the space round the ocelli shining and very sparsely punctured; scape shining, rather closely punctured, clothed beneath with long fulvous hairs, the two basal joints of the flagellum shining, the remainder covered with fine down. Pronotum sparsely punctured at the base, the posterior margin broadly smooth and shining, the propleuræ smooth and shining above, very finely striated below; the mesopleuræ shining and very sparsely punctured. Mesonotum sparsely punctured, the tegulæ finely punctured on the inner margin; scutellum and postscutellum with a few scattered punctures. Median segment very long, much longer than broad, almost smooth, but not highly polished; the three median carinæ nearly parallel, the outer ones less than half as far again from each other at the base as at the apex, the surface of the posterior truncation irregularly rugulose, the sides of the segment finely obliquely striated. Abdomen shining; the two basal segments almost entirely smooth, the first with a transverse row

of punctures before the apex and rounded anteriorly, the second with a transverse, longitudinally striated groove at the base; the third sparsely and finely punctured at the base and apex; the fourth and fifth more closely punctured; the epipygium coarsely punctured-rugose at the base, smooth and shining at the apex. The first recurrent nervure is received just before the middle of the first cubital cell, the second just beyond the middle of the second cubital cell.

Black; the mandibles, the apex of the pygidium, and the spines of the tibiæ and tarsi ferruginous brown; antennæ fusco-ferruginous beneath and at the extreme apex. Wings hyaline, tinted with yellow, stigma and nervures ferruginous.

Length 9 mm., exp. 14 mm.

Hab. Theresopolis, S. Brazil.

Type in B. M.

Tiphia jonesii, sp. n.

♂. Clypeus finely and very closely punctured, the anterior margin truncate. Front finely and very closely punctured, thinly clothed with long, pale, fulvous pubescence, the space round the ocelli shining, sparsely and more coarsely punctured; the scape finely punctured, shining and clothed beneath with rather long, pale fulvous pubescence. Pronotum finely and closely punctured, the posterior margin rather narrowly smooth and shining; propleuræ finely and obscurely striated, smooth and shining at the top. Mesonotum and scutellum shining and rather sparsely punctured; the median segment subopaque, with the usual three carinæ, the two outer carinæ more than twice as far apart at the base as at the apex; finely punctured, aciculate near the lateral margins, the sides of the segment closely striated; the mesopleuræ rather sparsely punctured. Abdomen closely punctured, with sparse fulvous pubescence, the first segment rather short, the apical half smooth and shining, with a transverse row of fine punctures before the apex, the second segment more sparsely punctured than the following one. Radial cell short, the second cubital cell extending beyond it, the second transverse cubital nervure strongly oblique and interstitial with the oblique apical nervure of the radial cell. The first recurrent nervure is received at the middle of the first cubital cell, the second just beyond the middle of the second cubital cell.

Black; the pubescence on the sides grey, on the dorsal surface very pale fulvous; the antennæ beneath fusco-ferruginous, the tarsi except the basal joint, and the spines of the tibiæ and tarsi ferruginous. Wings hyaline, stigma and nervures ferruginous.

Length 7 mm.

Hab. Castro; Parana (*E. Dukinfield Jones*).

Type in B. M. Described from two specimens.

Tiphia flavipennis, Spin.

Tiphia flavipennis, Spin. Ann. Soc. Entom. France, (1) x. p. 102 (1841), ♀ (nec Smith).

Tiphia elegans, Cam. Biol. Centr.-Amer., Hym. ii. p. 240 (1893), ♂ ♀.

Tiphia ochroptera, D. T. Cat. Hym. viii. 189 (1897).

I do not understand why Dalla Torre sinks Spinola's name, which has priority over Smith's. As Smith's name has to sink, I propose *T. borneensis* for that species. I regard specimens from the continent of Asia which have been referred to *flavipennis* as distinct.

Tiphia intricata, Sm.

Tiphia intricata, Sm. Descr. N. Sp. Hym. p. 188. n. 13 (1879), ♂ ♀.

Tiphia carmata, Cam. Biol. Centr.-Amer., pt. 112, Hym. ii. p. 245 (1893), ♂ ♀.

Tiphia parallela, Sm.

Tiphia parallela, Sm. Descr. N. Sp. Hym. p. 185. n. 7 (1879), ♀.

Tiphia gaumeri, Cam. Biol. Centr.-Amer., Hym. ii. p. 244 (1893), ♀.

Tiphia inornata, Say.

Tiphia inornata, Say, Keating's Narrat. Exped. ii. App. p. 331 (1824).

? *Tiphia guatemalensis*, Cam. Biol. Centr.-Amer., Hym. ii. p. 241 (1893).

The differences in sculpture seem to be too slight to be of specific importance.

Genus PŒCILOTIPHIA, Cam.

As I have before said, I agree with Ashmead in regarding this genus as allied to *Myzine* rather than to *Tiphia*. Although there are only two cubital cells as in *Tiphia*, the second transverse cubital nervure seems to be missing, not the first as in *Tiphia*. The female is unknown.

In spite of some differences in neuration, I am inclined to think that the following species are nearly allied to this genus: *Methoca rugosa*, Cam., in which there are two cubital cells, and *Myzine dimidiaticornis*, Bingh., in which there are three. They show many points in common, and are not well placed in the genera to which the authors have assigned them. The claws of *M. dimidiaticornis*, however, are bifid, not simple, which together with the difference in neuration may be sufficient to form a new genus for it, but it is better to wait till the female is known. The antennæ of all three species differ widely from those of *Myzine*, and the pronotum is much longer.

BIBLIOGRAPHICAL NOTICES.

Economic Ornithology.

1. *Food Habits of the Grosbeaks.* U.S. Department of Agriculture, Bull. 32. Washington Government Printing Office. 1908.
2. *Birds that eat Scale-Insects.* Reprint from Yearbook of Department of Agriculture. 1906.

In the matter of economic ornithology we in England are disgracefully behind the times; the Board of Agriculture seemingly prefers to leave this matter to private enterprise, or to deal with the matter in such a perfunctory manner as to be positively ridiculous, making us the laughing-stock of the nations.

On the Continent and in the United States things are different. In the United States, indeed, for many years past, the study of birds in their relation to man has been vigorously prosecuted, and splendid results have rewarded this zeal.

The two pamphlets now before us are most admirable examples of their kind, and should be carefully studied by all who are interested in this matter.

The first on our list is by Mr. W. L. McAtee, an Assistant of the Biological Survey, and it is a model of what such work should be.

The Author surveys the food eaten by five species of grosbeaks, representing the genera *Cardinalis*, *Pyrrhuloxia*, *Zamelodia*, and *Guiraca*, and giving for each species a most exhaustive account of the animal and vegetable constituents of the food, supplemented by illustrations of all the more important plants and insects and excellent figures of the birds themselves.

It would be impossible in the space of a short review to give an adequate account of the Author's conclusions, but suffice it to say that he has shown beyond cavil that these birds, which have been condemned now by the farmer and now by the fruit-grower—some species showing at certain times of the year a fondness for fruit and some for grain,—are, on the whole, unquestionably extremely valuable birds, devouring immense quantities of the seeds of certain noxious weeds. The five species studied consume nine times more weed-seed than grain and fruit, and nineteen times more injurious than useful insects.

In his second paper on 'Birds that eat Scale-Insects' the Author first outlines the appalling damage done by these insects to orchards, and then goes on to give a brief outline of the various species of birds which prey more or less on these pests. No less than fifty-seven species of birds have been found to eat scale-insects, and nearly all are, as might be supposed, arboreal species. What proportion these insects form of the total quantity of food eaten is a matter which is yet under investigation, but it would seem that some species eat large quantities thereof.

British Museum Guides.

1. *A Guide to the Exhibited Series of Insects.* Price 1s. 1908.

2. *Guide to the Gallery of Fishes.* Price 1s. 1908.

London : Printed by Order of the Trustees of the British Museum.

As popular text-books of zoology the guide-books sold over the counter of the Natural History Museum probably stand unrivalled, for they display a wealth of illustration which is truly marvellous, while it is certain that in the matter of concentrated information they hold an almost unique position.

The Guide to the Exhibited Series of Insects has been written by Mr. C. O. Waterhouse, and this in itself is a sufficient guarantee of sterling work.

After a brief introduction on the broad outlines of the structure of insects, the Author proceeds to pass in review all the principal orders and families into which this class is divided, illustrating his remarks by brief sketches of the more remarkable species, their life-history and habits. When we remember that Mr. Waterhouse has had to make this selection out of a possible 155,700 named species, the magnitude of his task becomes dimly realizable. Incidentally we may remark that the study collection now housed in the Museum contains about 1,150,000 specimens !

The Guide to the Fish Gallery has been written by Dr. W. G. Ridewood, and is in every way worthy of the great series of which it forms a part. The Author has devoted many years of study to the fishes, and to him, it may be remarked, Sir E. Ray Lankester, the late Director of the Museum, entrusted the rearrangement of the specimens with which this Guide is concerned. During this work Dr. Ridewood effected a marvellous transformation, and in the pages of this little volume he briefly traces, for the benefit of the visitor, all the more striking and interesting facts concerning the specimens so beautifully displayed. But beside this he has contrived to include a most helpful and concise account of the classification of fishes and the more important features in their anatomy, at any rate in so far as this bears upon their systematic position.

Those who have a mind, it may be remarked, to acquaint themselves with the last word in the classification of fishes may with profit consult the pages of this Guide, for many new features have been introduced into the systematic arrangement of this group during the work of remodelling the Gallery. Many of the orders and most of the subdivisions thereof which appear in this Guide will be found to be new—that is to say, a more or less reshuffling of the orders of other authors has taken place in order, if possible, to express the phylogenetic relationships of the groups concerned one to another. This, of course, will not meet with universal approval, no system of classification ever does ; but it will certainly stimulate further work, and thus serve a most useful purpose.

C. B. WILSON. *North-American Parasitic Copepods belonging to the Family Caligidae.—Parts 3 & 4. A Revision of the Pandarinæ and Cecropinæ.* Proc. U.S. Nat. Mus. vol. xxxiii. pp. 323-493, plates xvii.-xlvi. December 1907.

THE parasitic Copepoda are a group of which the study is rendered particularly difficult by the great changes which take place during growth, by the remarkable and varied sexual dimorphism, and by the absence, in recent years, of anything like a serious revision of the group or of any considerable part of it. This last difficulty Dr. Wilson has courageously set himself to remove in the series of memoirs of which this is the latest. That his work will be of very great value to future students cannot be doubted. The material at his disposal is larger than in the case of most earlier writers; he has been able to examine and to identify the larval stages of a number of species in the different subfamilies; the figures which he gives are numerous, and, if somewhat inartistic and lacking in detail, are clear and apparently accurate. It is much to be regretted, however, that a little more trouble was not taken at the outset to make quite clear the relation between the morphology of the parasitic groups and that of the free-living forms. Dr. Wilson recognizes "twelve pairs of appendages, namely, two pairs of antennæ, one pair of mandibles, two pairs of maxillæ, two pairs of maxillipeds, and five pairs of swimming-legs." How this series of appendages is to be compared with that of the typical free-swimming Copepoda we are not told, nor is it easy to guess.

W. T. C.

MISCELLANEOUS.

The Genotype of Cidaris.

To the Editors of the *Annals and Magazine of Natural History*.

GENTLEMEN,—Dr. H. L. Clark's able advocacy of his views in the June number of the 'Annals' helps to make clear the precise difference between us.

Except for a few advocates of pre-Linnean and non-binomial names, we all agree to ascribe *Cidaris* to Leske. It follows by the rules that the genotype must be one of the species assigned by Leske himself to *Cidaris*. Being unable to discover on what grounds other authors had selected *C. papillata*, I applied the rules, and found these to lead to the same result. Rightly or wrongly, Dr. Clark accepts no other of Leske's species as a *Cidaris* at all, and is therefore bound either to accept *C. papillata* or to reject the generic name. Essentially he does accept it, and it is with the next step that trouble begins.

We all agree that Leske's sections I., II., and III. represent three

distinct species. Which of them is to be regarded as the true *C. papillata*? My application of the rules led me to decide on no. III. Dr. Clark objects to my application, but arrives, like every one else, at the same result. Now comes the divergence. I maintain that if species no. III. is rightly called *Cidaris papillata*, it must be the genotype. Dr. Clark rejects this obvious course and fixes on no. II., which was first made a separate species by Lamarck under the name *Cidarites tribuloides*. But a species unrecognized as such by Leske cannot (by Internat. Code, Art. 30, II. e, a) be the genotype of Leske's own genus, unless, indeed, it prove after all to be a synonym of *C. papillata*, in which case it must take that name.

Why does Dr. Clark refuse to take *C. papillata* s. str. as the genotype? I accept his disclaimer of the reason I gave: "because *Dorocidaris* A. Ag. thus becomes a synonym of *Cidaris*," and quote his own words: "A. Agassiz in 1869 removed *papillata* s. str. to *Dorocidaris*." It would be more correct to say that in 1863 (Bull. Mus. Comp. Zool. i. p. 17) A. Agassiz restricted "*Cidaris Klein*" to *C. thouarsi*, *C. tribuloides*, *C. annulata*, *C. baculosa*, and allied species, and that he removed to *Orthocidaris* Ag. *C. hystrix*, *C. affinis*, and "*C. papillata* Flem.," but that, finding the name *Orthocidaris* preoccupied by Cotteau, in 1869 he altered it to *Dorocidaris*. The type of *Dorocidaris* was not fixed; but, since in the 'Revision of the Echini' Mr. Agassiz (p. 105) recognized that all the species he had referred to it were synonyms of *C. papillata* Leske, it follows that the genotype of *Dorocidaris* is *Cidaris papillata* Leske. Whether the *Cularis* of A. Agassiz, 1863 and 1872, can correctly be regarded as equal to a restricted *Cidaris Klein* need not be discussed; it is, however, interesting to note that it was not claimed as in any way representing *Cidaris* Leske—that position was reserved for *Dorocidaris*. It follows, then, that from the beginning *Dorocidaris* was a synonym of *Cidaris* Leske, and therefore those who accept *Cidaris* Leske must reject *Dorocidaris*. In a word, you cannot make *Cidaris papillata* s. lato the type of *Cidaris*, and *Cidaris papillata* s. str. the type of *Dorocidaris*.

Mr. P. Thiéry has kindly pointed out to me that, in resuscitating the name *Gymnocidaris* A. Ag., 1863, I overlooked the prior use of the name by L. Agassiz (1838, 'Monogr. des Salenies,' p. 3). This name has been re-established by Mr. Lambert (see Zool. Record for 1900). Apparently, then, a name is still required for "*Cidaris Klein* restr. A. Ag."

Two further criticisms made by Dr. Clark need consideration.

I said that J. E. Gray (1825) fixed the genotype as *C. imperialis* Lam. Dr. Clark says "He simply mentions" that species "as an example of *Cidaris*, in contrast to *Diadema*." This is an extraordinary representation of Gray's action. The paper is a professedly systematic paper by a revising systematist, being "An attempt to divide the Echinida, or Sea Eggs, into natural Families." It deals with a large number of genera, many of them new, and even though

Gray did not use the expression "type," except in his last paragraph, we have only to compare it with other papers by Gray in the same volume to see that the single species quoted were intended by him as genotypes. If, then, Gray is put out of court by the rigid application of the Code, *a fortiori* must this be the case with Brandt and others.

"It seems to" Dr. Clark "absurd to suppose that Brandt (1835) expected or intended that both his 'Section A' and 'Section B' of *Cidaris* were to be called *Phyllacanthus*." This is not quite what I said. In the first place, Brandt did not mention a Section A and Section B of *Cidaris*. He established *Phyllacanthus* as a new subgenus of *Cidaris* (or *Cidarites* Lam., as he called it), and he said in his diagnosis of *Phyllacanthus* that the ambulacra might be straight or waved. He then divided *Phyllacanthus* into two Sections: A, with ambulacra straight; B, with ambulacra waved. Since the collection of Mertens contained only examples of one species—*C. (Phyllacanthus) dubia*—and since this came into Section B, Brandt mentioned Section A in the footnote alone. The type of Section A is undoubtedly *Cidarites tribuloides* Lam.; the type of Section B was not fixed. From this it is not so clear to me as it is to Dr. Clark that Brandt "selected *dubia* as the type of *Phyllacanthus*."

Having disallowed Gray and admitted that Brandt does not "distinctly state that *tribuloides* is the type of *Cidaris* s. str.," Dr. Clark then falls back on elimination, and contends for stability of nomenclature, more particularly the nomenclature established in the 'Revision of the Echini.' Mr. Alexander Agassiz, when he penned the admirable chapter on "Nomenclature" in that great work, frankly stated (p. 13) that he did not intend to impose on any one the names there adopted, often in defiance of the Codes. It is rather too late now for his coadjutor to begin the attempt. We all desire stability of nomenclature, but the best way of attaining it is to see that the foundations are secure and the superstructure in accord with the canons of the builder's art.

F. A. BATHER.

Natural History Museum,
London, S. W.,
5th June, 1908.

Note on the Squirrel-Genus "Zetis." By OLDFIELD THOMAS.

I regret to find that in giving the name *Zetis* to the long-nosed Oriental squirrels of the *pernyi-rufigenis* group (Journ. Bombay Nat. Hist. Soc. xviii. p. 244, 1808) I overlooked the fact that Père Heude had already proposed for the genus the name *Dremomys* (Mem. H. N. Empire Chinois, iv. pt. 2, p. 54, 1898). That name must therefore be used for all the squirrels referred to *Zetis* in my list, including the new Formosan species *Dremomys oswaldi*.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 8. AUGUST 1908.

XV.—*On new Species of Histeridæ and Notices of others.*
By G. LEWIS, F.L.S.

THIS is the thirty-fourth paper on the Histeridæ in this Magazine, and in these papers and in those published by me elsewhere there are over 700 species described and about 55 genera established. Marseul described about 700 species and founded 85 genera, so that his work and mine are nearly equal as regards the number of species noticed; but Marseul's work is of more value, owing to the large number of figures given in his monograph. Marseul began his monograph fifty-five years ago, and it is nineteen years since his last paper was published; in describing his species he generally drew outlines of them, even when the drawings were not published.

There are several new species of *Tribalus* noticed in the present paper, the number now described being over 30, and there are perhaps as many more nondescripts in collections, so that ultimately the genus is likely to prove to be a large one. At the date of the Munich Catalogue only 9 species were known; three species occur in the European area, and the others are African or Asian. Formerly Dr. G. H. Horn included two American species in *Tribalus*, but these are now referred to *Cærosternus* and *Stictostix*; the single species of the first genus has, as already recorded (Ann. & Mag. Nat. Hist. xvi. p. 213, 1885), an antenna with a solid club, and the species

of the second genus, also single, corresponds somewhat curiously with several Australian forms.

It may be well to give the origins of two names lately used for new genera. The variolose surface-sculpture of *Sitalia severini*, Lew., figured in 1900, suggested the name for this Indian genus. The Hindu has made the disease variola a member of his Pantheon, and under the name of the goddess Sitalia pays it worship and honour. The name of the genus *Santalus* was formed from Santal, a negro-like aboriginal tribe of India; the species are all Oriental and the area of their distribution limited, so far as is now known, to India, Burma, and the Eastern Archipelago.

There are two remarkable instances in this family of the geographical distribution of peculiar species which are worthy of notice. In the genus *Hololepta* there are ten species which have a conspicuous curved or arched sulcus in the propygidium, and these species have a range from Japan through India to South Africa. And in the genus *Anaglymma* there are nine species whose distribution extends from the Malay Archipelago and India to Cape Colony, and there is every likelihood that some species will ultimately be found in the far East. All the species of both genera are subcortical in their habits and in Central Africa are found on both coasts.

In the Catalogue published in 1905 I did not give the names of the Histeridae known and described from the tertiary sedimentary strata as fossils; but at the end of this paper I give a list of them, compiled by Professor T. D. A. Cockerell, of the University of Colorado. I believe the list is complete to date, and I have been courteously permitted to publish it. Heer's paper was published in 1864, before the inauguration of the 'Zoological Record'; but one name in the list is dated 1888. Judging from the figures given of the fossilized species, there appears to be in several of them a thoracic stria which is continued along the base; in the existing species, over 2300, this characteristic is only observed in three.

List of Species.

Hololepta enodipyga.

Teretrius africus.

— *erythræus.*

Platysoma vagans, Lew.

Mendelius, gen. nov.

— *lineipennis.*

Omalodes obliquistrius.

— *simplex.*

— *chapadæ.*

Macrolister debellatus.

Hister maroccanus, Sch.

— *amplicollis*, Er., 1840, =

thoracicus, Payk., 1811.

— *vadatus*, Lew.

— *arcatus.*

— *lineisternus.*

— *sulcimargo.*

— *honestus.*

Hister bahiensis.	Phelister (Hister) præcox, Er.
— planifrons.	— (—) pusio, Er.
Atholus malaysi.	— rectisternus.
Tribalus cavernicola, Lew.	— testudo.
— puncticeps.	— fractistrius.
— suturalis.	— pygidialis.
— laevidorsis.	— colombiae.
— bicarinatus.	— rubricatus.
— unistrius.	— carinistrius.
— semen, Lew.	Phoxonotus suturalis.
Pachycererus atratus.	

Hololepta enodipyga, sp. n.

Oblongo-ovata, depressa, nigra, nitida; fronte bistrata; pronoto latoribus obsolete punctato, stria marginali antice anguste canaliculata; elytris striis dorsalibus haud appendiculatis; pygidio fore leevi.

L. 7 mill. (absque mandibulis).

Oblong-oval, very flat, black and shining; the head smooth, with two short bent frontal striae, labrum very small and bilobed, ♂ mentum smooth and not carinate; the thorax somewhat transverse, scarcely rounded off at the base, but distinctly so at the anterior angles, lateral stria complete and anteriorly narrowly canaliculate, within it there is an obscure narrow line of punctures, base feebly bisinuous; the elytra, striae, 1 dorsal short, basal, but well marked, 2 very short, there is no apical appendage; the propygidium has a few lateral punctures, but they do not extend to the apex; the pygidium is seemingly smooth, but there is a fine and thinly spread punctuation seen under the microscope; the prosternum, keel wide at both ends, but somewhat constricted in the middle; the anterior tibiæ 4-dentate.

The species may be placed near *H. pygolissa*, Mars., but the thorax is not so much rounded off behind and the thoracic lateral stria resembles that of *Lioderma vicinum*, Lec.

Hab. Pilcanoto, Peru.

I only know the male.

Teretrius africus, sp. n.

Cylindricus, subelongatus, brunneus, nitidus, undique punctatus, antennis pedibusque concoloribus; pronoto marginato; prosterno bistrato, striae anticis conjunctis; mesosterno marginato; tibiis anticis 6-denticulatis, posticis 3-spinosis.

L. 1½ mill.

Cylindrical, rather long, brown, and shining; the head, punctures largest nearest the base; the thorax marginate

behind the head and laterally, punctuation largest and clearest near the base, the punctures along the base are evenly and transversely placed, those behind the anterior angles are closer and less distinct; the elytra, punctuation most clear at the base; the pygidia are evenly and not closely punctured; the prosternum is rather coarsely punctured, anterior lobe marginate, keel is narrow and between the striae feebly canaliculate, the striae gradually meet anteriorly, but they are somewhat obscurely indicated owing to the punctuation; the mesosternum is obtusely acuminate and margined narrowly, surface and that of the metasternum is clearly but not closely punctured; the metasternum is striate laterally; the anterior tibiae are 6-denticulate, posterior 3-spinose, the tarsal spine being bifurcate.

The colour of this species somewhat resembles that of *T. pulex*, Fairm., but *pulex* has a broad and flat prosternal keel and its striae are parallel to each other and far apart and the mesosternal marginal stria is distinctly farther from the edge. These characters are noticed now for the first time.

Hab. Togoland, E. Africa.

Terebrarius erythræus, sp. n.

Cylindricus, sublongatus, niger, nitidus, supra undique punctatus; prosterno bistriato, striae subparallelis, sparse punctato; mesosterno stria marginali postice abbreviata; pedibus rufis, tibiis anticis 7-8-denticulatis.

L. 2½ mill.

Cylindrical, rather elongate, black and shining, evenly and rather closely punctured above; the thorax, marginal stria complete, fine behind the head and sinuous at the base; the elytra, suture behind the scutellar region a little elevated and the humeral smooth space is also somewhat raised; the pygidia are evenly, not closely punctured; the prosternum, striae not quite parallel, but widen out gradually and slightly anteriorly, surface microscopically strigose, with a few large shallow round punctures; the mesosternum somewhat acute in the middle, marginal stria anteriorly complete but fine, and it does not pass the coxae, so that there is a marked interruption between it and the metasternal lateral stria, the meso- and metasterna are sparingly punctured and the points are smaller and not circular like those of the prosternum; the legs are reddish and the anterior tibiae are 7-8-denticulate.

In form this species most resembles *T. latebricola*, Lew., but it is somewhat less narrow.

Hab. Ghinda, Erythræa.

Platysoma vagans, Lew. Ann. & Mag. Nat. Hist. xiii.
p. 138 (1884).

The pygidium of this species is immarginate and convex; the prosternum is marginate between the coxae and along the base; the mesosternal marginal stria is very strong and is not connected at the suture with the metasternal lateral stria. In these characters it agrees with *P. lewisi*, Mars., a species occurring in China and Japan. I have lately seen many examples from Sapporo, in Yezo.

MENDELIUS, gen. nov.

Body oblong, depressed, parallel at the sides, brown or piceous; head retractile, antennal funiculus gradually enlarging to the club, club oval, frontal stria fine; thorax rather broader than long, antennal fossa large, in the anterior angle, deep and wholly open below, lateral stria sinuous and leaving a wide interstice; elytra 5-6-striate; propygidium transverse; pygidium marginate exteriorly or deeply foveolate; prosternum finely marginate posteriorly, anterior lobe rather wide; mesosternum widely emarginate and bordered by a stria; legs somewhat long and slender, anterior tibiae 4-5-dentate, tarsal grooves short, shallow, and not curved, tarsus rather short.

Type, *Eblisia tenuipes*, Lew.

I have established this genus on seeing two additional species, one from Japan and one from India, which resemble *tenuipes*, which, as I indicated before, could not well be left permanently in *Eblisia*. The prosternal striae are similar to those of *Platysoma lewisi*, Mars., and *vagans*, Lew., but the tarsal grooves more nearly resemble those of a species of *Phelister*.

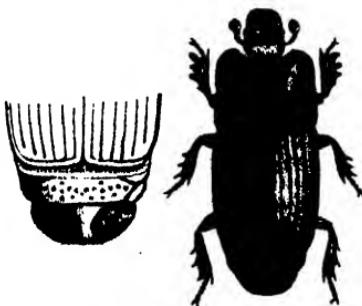
Mendelius lineipennis, sp. n.

Oblongus, parallelus, depresso-piceus, nitidus; fronte concava, impunctata, stria leviter impressa; pronoto stria laterali valde impressa; elytris 6-striatis, 5 et suturali antice conjunctis; prosterno basi marginato; tibialis anticus 4-dentatis.

L. 4 mill.

Oblong, parallel at the sides, depressed, piceous and shining; the head smooth, forehead concave, stria well marked laterally, fine and bisinuous anteriorly; the thorax, surface faintly and sparingly punctured, marginal stria very fine and complete, lateral stria deepest anteriorly, interstices

rather wide and widest at the base, fine and crenulate behind the head but slightly broken behind the eyes, it is also continued but finely along the base close to the edge, on the disk are two foveæ, separated by nearly the width of the head; the elytra have two fine epipleural striae, 1-3 dorsal complete, 4 is a very little shortened at the base, 5 and sutural complete and join anteriorly and apically the tips of both turn outwards; the propygidium is narrow and transverse and crossed in the middle by a line of irregular punctures; the pygidium is impunctate and very largely excavated on either side at the base; the prosternum has a marginal stria



Mendelius lineipennis.

round its base and the striae are produced just beyond the coxae, but do not join; the mesosternum is widely emarginate behind the prosternal keel and the marginal stria is well marked and complete and continues laterally along the metasternum; the first abdominal segment also has a well-marked lateral stria; the anterior tibiae are 4-dentate.

The thoracic foveæ, such as are noted above, are, in the Histeridae, sometimes (though rarely) only of individual, not specific, character.

Hab. Nilgiri Hills, India (*H. L. Andrewes*, no. 747).

Type in the Andrewes' Collection.

Omalodes obliquistrius, sp. n.

Ovalis, convexus, niger, nitidus; fronte oblique striata, antice excavata; pronoto post oculos bipunctato; propygidio grosse punctato. L. $7\frac{1}{2}$ mill.

Oval, convex, black and shining; the head feebly punctulate, with two oblique striae commencing near the middle of the eyes and joining anteriorly, behind the point of meeting the forehead is excavated; the thorax, marginal stria strong and complete, surface smooth, with a puncture behind either

eye and distant from the margin by one-third of the thoracic length; the elytra, striæ, inner humeral apical, dimidiate, and curved, dorsal very fine, 1 apparently shortened at the base, 2 not traceable at the base or apex, 3 dimidiate and basal; the propygidium is coarsely punctate, closely so at the sides, more sparingly in the middle; the pygidium is evenly punctate; the prosternum is without striæ; the mesosternum, marginal stria is widely interrupted; the anterior tibiae 4-dentate.

The frontal striæ are a marked character in this species; the thoracic punctures resemble those usually seen in *O. laceratus*, Mars., but Marseul did not notice the punctures in his description of his species, and rightly, as the punctures are sometimes wanting.

Hab. Santa Fé, Bogota.

Omalodes simplex, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte puncticulata, stria circulari antice vage interrupta; elytris striis 1-2 integris, 3 dimidiata punctis continuata; propygidio pygidioque fortiter punctatis; tibiis anticis 4-dentatis.

L. 6 mill.

Oval, rather convex, black and shining; the head very feebly impressed longitudinally, stria semicircular, vaguely interrupted anteriorly, surface irregularly punctulate; the thorax, stria complete, with a few small punctures behind the anterior angle, behind the eyes away from the margin is faintly seen a somewhat elongate impression (corresponding to the punctures in *O. obliquistrius*), scutellar fovea well marked; the elytra, striæ, outer humeral fine and clear from before the middle to the apex, dorsal 1-2 complete, but composed of points towards the apex, 3 basal and dimidiate but traceable as fine points to the apex, 4-5 indicated by apical points only, sutural consists of points which disappear beyond the disk; the propygidium is coarsely and not closely punctate, points fewest on the disk, and without foveæ; the pygidium is more evenly punctate; the mesosternum, marginal stria widely interrupted, suture well marked by a straight stria.

Hab. Trinidad (Ellacombe).

Omalodes chapadæ, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte stria tenuiter impressa retrorsum acuminata; pronoto leví; elytris humeris valde

prominulis, striis 1-3 integris crenatis; propygidio foveolato; 1° ventrali abdominis segmento dense strigoso-punctato; tibiis anticus 4-dentatis.

L. 5 $\frac{3}{4}$ mill.

Oval, rather convex, black and shining; the head clearly punctulate, frontal stria rather fine, complete, and retroflexed anteriorly, median area lightly impressed; the thorax, stria complete, disk microscopically punctulate, lateral margins clearly punctulate, scutellar fovea round and well marked; the elytra, striae, outer humeral shortened at the base, curved apically, inner humeral represented by a row of fine points, 1-3 markedly complete, with somewhat crenulate edges, 4-5 and sutural are vaguely shown by fine punctures, behind the humeral angle there is a prominent boss and at the apical edge of the elytra between the second and third striae is a marked depression; the propygidium is finely and not closely punctulate, with two round very distinct foveæ; the pygidium is finely and evenly punctulate; the sterna are clearly punctulate, the mesosternal stria interrupted, and the first segment of the abdomen is conspicuously and densely strigose-punctate.

The above somewhat resembles *O. pulvinatus*, Er., but the third dorsal stria is complete, the humeral angle very prominent, and the first ventral segmaent densely sculptured.

Hab. Chapada, Brazil (*H. H. Smith*).

Macrolister debellatus, sp. n.

Oblongo-ovatus, parum convexus, niger, nitidus; fronte stria integra, antice recta; pronoto lateribus fulvo-ciliato, stria interna integra, externa laterali margini proxima, post angulos a margine parum distanti; elytris striis 1-3 integris, 4 basi minus abbreviata, 5 dimidiata, suturali arcuata; propygidio pygidioque punctulatis.

L. 9-9 $\frac{1}{2}$ mill.

Oblong-oval, rather convex, black and shining; the head smooth or microscopically punctulate, stria well marked and anteriorly straight; the thorax margined with a yellow pile, external stria two-thirds the length of the thorax and hamate behind the anterior angle, where it departs slightly from the edge, internal complete behind the neck, markedly sinuous laterally and somewhat distant from the edge; the elytra, striae, inner humeral apical and passing the middle, dorsal 1-3 complete, 4 slightly abbreviated at the base, 5 less marked and dimidiate, sutural is rather shorter than the fourth and turns away from the suture at both ends; the pygidia are finely punctulate, the points of both being larger

and more distinct along their bases; the prosternum is not striate; the mesosternum is emarginate and the marginal stria complete; the anterior tibiæ are 3-dentate.

This species is very similar to *M. pilicollis*, Sch. It differs by the form of the extornal thoracic stria, which is not close to the edge behind the anterior angle, by the internal stria being more sinuous laterally, and by the fine punctuation of the pygidia.

Hub. Mombasa, E. Africa.

Hister maroccanus, Sch. Ent. Nachr. xiii. p. 353 (1887).

The above was described as a variety of *H. amplicollis*, Er., but I think that it is a distinct species; it differs by the very narrow interstices of the lateral thoracic stria and by the fine surface-punctuation, which resembles that of *H. græcus*, Brullé.

Hister amplicollis, Er., 1840, = *thoracicus*, Payk., 1811,
n. syn.

As no species resembling Paykull's figure of *thoracicus* has been found in America, I sent an example of *amplicollis* to Prof. Yngve Sjöstedt, who has compared it with Paykull's type of *thoracicus*, and he has found that it corresponds except in a slight variance in the denticulations of the anterior tibiae. Paykull's figure of *thoracicus* represents *amplicollis* very well, and there has been evidently a case of mistaken locality. The outer thoracic stria in the species is often complete, but I selected one with a short stria to send to Stockholm, as it is so figured in Paykull's monograph.

Hister vadatus, Lewis, 1908.

Ovalis, convexus, niger, nitidus; fronto stria antice recta; proproto bistrati; clytris striis 1-4 integris, 5 obsolete, suturali utrinque abbreviata; propygidio pygidioque punctatis; mesosterno stria marginali in medio intorrupta; tibiis anticis 3-dontatis, apicali dente immani.

L. 7 mill.

Oval, convex, black and shining; the head, frontal stria complete, straight anteriorly, and rounded off on either side; the thorax, marginal stria very fine, two lateral well-marked and parallel to each other, the outer stria terminates behind the eye, inner continued behind the head; the elytra, humeral stria wanting, dorsal 1-4 complete, 5 indicated by a few apical points, sutural abbreviated at both ends, the ends turn away

from the suture; the pygidia are clearly not closely punctured with microscopical points in the interspaces; the prosternum, lobe marginate and impunctate; the mesosternum is feebly sinuous anteriorly and the marginal stria is interrupted in the middle; the anterior tibiae 3-dentate, apical tooth very large.

The above is similar to *H. obesus*, Fahr., and others by the thorax being bistriate laterally and the terminal tooth of the anterior tibia being very large.

Hab. Meru, at the River Ngare na nyuki, 22nd November, 1905.

Hister arcatus, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte stria tenuiter impressa; pronoto stria interna subintegra, externa nulla; clytris striis 1-3 integris, 4 basi abbreviata, 5 obsoleta, suturali ultra medium abbreviata; propygidio pygidioque modice punctatis; mesosterno antice arcuato, stria integra; tibiis anticis 3-dentatis.
L. 6½-7 mill.

Oval, rather convex, black and shining; the head not impressed, stria rather fine and complete, nearly straight anteriorly; the thorax, marginal stria interrupted behind the head, outer lateral wanting, inner well-marked, shortened at the base, sinuous in the middle, and continued, but finely, behind the head; the elytra, striae, humeral both wanting, 1-3 complete, 4 shortened slightly at the base, 5 apical and rudimentary, sutural reaches just beyond the middle and is a little shortened behind; the pygidia are clearly but not closely punctate, the apex of the pygidium is smooth; the prosternum, keel narrow between the coxae, anterior lobe somewhat pointed and marginate; the mesosternum is evenly arched anteriorly and the marginal stria is rather strong, crenate, and parallel to the edge, and does not quite join the metasternal lateral stria; the anterior tibiae are 3-dentate.

The form of the mesosternum is an important character; it is not truncate like that of *Atholus corvinus*, Germ., and I have not included it in Thomson's genus.

Hab. Nguelo, Usambara, E. Africa.

Hister lineisternus, sp. n.

Ovalis, subconvexus, niger, nitidus; fronte stria antico biarcuata; pronoto stria interna pone oculos parum deflexa; clytris striis 1-3 integris, 4-5 brevissimis, suturali ultra medium abbreviata; prosterno bistrato; tibiis anticis 3-dentatis.
L. 5 mill.

Oval, rather convex, black and shining; the head feebly impressed, stria strong and biarcuate; the thorax, stria external fine and shortened before the base and interrupted behind the neck, internal also rather fine, feebly sinuous laterally, and deflected behind the eye; the elytra, striæ, inner humeral well-marked, apical, and passing the middle, 1-3 dorsal complete and also strong, 4-5 apical and rudimentary, sutural apical and just passing the middle; the pygidia are clearly not dense nor coarsely punctured; the prosternum, keel bistriate in the middle, the striæ do not reach the base nor the suture behind the anterior lobe; the mesosternum is feebly emarginate, stria fine and complete; the anterior tibiae are 3-dentate, the apical tooth being slightly bifid. In one example the fourth stria is dimidiate.

The chief distinguishing character of this species is the bistriate prosternum; otherwise it is very similar to *H. niloticus*, Mars. The frontal stria in *niloticus* is acuminate in the middle, not biarcuate; *semiplanus*, zulu, Mars., with *coprophilus*, Reiche, belong to the same group.

Hab. Mount Chivinda, Gazaland (*Guy A. K. Marshall*, November 1901), and Usambara (*Julius Weise*, 1901).

Hister sulcimargo, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte haud impressa, stria antice recta; pronoto striis validis integris, intervallo leví; elytris striis humerali interna et 1-3 dorsalibus integris, 4 tenuissima, 5 obsoleta, suturali ultra medium abbreviata; propygidio pygidioque dense punctatis.

L. 7-7½ mill.

Oval, rather convex, black and shining; the head not impressed, stria complete and straight anteriorly; the thorax, the two lateral striæ are deep and complete and rather near together, the interspaces between the outer edge and the two striæ being nearly equal in breadth, inner stria widely sinuous and continued but rather finely behind the neck and deflected behind the eyes, outer lateral hainate anteriorly and ceasing behind the angle; the elytra, striæ, inner humeral and 1-3 dorsal complete, 4 very fine and sometimes traceable along its whole length, 5 apical very short and punctiform, sutural apical and just passing the middle; the pygidia are wholly evenly and very densely punctate; the prosternum, the anterior lobe with two marginal striæ; the mesosternum is emarginate, with a rather fine marginal stria following the contour of the segment; the anterior tibiae are 3-dentate.

This species may be placed near *H. vilos*, Mars., and *scabripygus*, Sch.

Hab. Salisbury, Mashonaland (*Guy A. K. Marshall*, Nov. 1900).

It is a stercoraceous species.

Hister honestus, sp. n.

Ovalis, convexiusculus, niger, nitidus; elytris rubris, macula scutellari nigra; fronte stria transversa arcuata; pronoto stria laterali interna pone oculos deflexa; elytris striis dorsalibus integris, 5-6 basi conjunctis; mesosterno antice sinuato; tibiis anticis 3-dentatis.

L. 2 $\frac{2}{3}$ mill.

Oval, rather convex, black and shining; the head, stria complete and transversely bowed; the thorax, marginal stria fine and complete, outer lateral touches the base and ceases behind the eye, interstice between it and the inner lateral rather wide and widest anteriorly, inner lateral complete, sinuous before the base and deflected behind the eye; the elytra somewhat obscurely reddish, with the scutellar region and the disk blackish, striae, humeral short, bent, not touching the base nor quite reaching the middle, dorsal 1-4 complete, 5-6 also complete and joining at the base; the pygidia coarsely, clearly, and not closely punctured; the prosternum is microscopically strigous, anterior lobe strongly marginate, keel without striae; the mesosternum is feebly sinuous anteriorly and the marginal stria is somewhat crenate, very slightly bent in the middle, and is not quite close to the edge.

This species is exceedingly similar to *H. castus*, Lew., but the mesosternum is not arcuate in outline nor does the marginal stria follow so closely to the edge. In *honestus* the inner thoracic lateral stria is deflected behind the eye and the outer stria reaches the base. In *castus* the outer stria is usually shortened at the base and in some examples the fifth dorsal stria is sometimes slightly broken.

Hab. Salisbury, Mashonaland (*Guy A. K. Marshall*, January 1901).

Hister bahiensis, sp. n.

Ovatus, convexus, niger, nitidus; fronte stria semicirculari; pronoto stria marginali post oculos interrupta, stria laterali interna integra; elytris striis 1-3 integris, 4 et suturali dimidiatis, 5 brevissima; propygidio utrinque foveolato; mesosterno in medio sinuato, stria marginali tenuiter impressa; tibiis anticis 5-dentatis.

L. 6 mill.

Oval, convex, black and shining; the head obscurely punctulate, frontal stria semicircular; the thorax, marginal stria interrupted behind the head, outer lateral wanting, inner complete, fine behind the head and rather irregularly impressed laterally, behind the anterior angle there are a few fine points; the elytra, striæ, inner humeral a little shortened at the base, dorsal 1-3 complete, 4 and sutural equal and nearly dimidiate, 5 very short and broken, apex slightly transversely impressed; the propygidium and pygidium are evenly and rather closely punctured, the first has a distinct but rather shallow fovea on either side; the prosternum, anterior lobe margined, but the stria is only close to the edge at the apex; the mesosternum is slightly sinuous anteriorly and the marginal stria is fine and complete; the anterior tibiæ are 5-denticulate.

This species may be placed near *H. conductus*, Mars.

Hab. Bahia (E. C. Reed).

Hister planifrons, sp. n.

Ovatus, convexus, niger, nitidus; fronte haud striata; pronoto bistrigato, striis antice disjunctis; elytris stria subhumerali sinuata, integra, striis 1-4 integris, 5 suturalique valde abbreviatis; propygidio pygidioque parum dense punctulatis.
L. 5 mill.

Oval, convex, black and shining; the head without a frontal stria, feebly punctulate and somewhat uneven, there is a small fovea in the middle of the base, but it may not be constant; the thorax, marginal stria complete, outer lateral hamate and ceasing behind the anterior angle, inner complete except in being very slightly shortened at the base, scutellar fovea linear; elytra, striæ, subhumeral complete and widely sinuous in the middle, 1-4 complete, 2 sinuous in the middle, 4 and 5 joined at the apex, 5 and sutural very short; the propygidium and the pygidium are evenly and rather closely punctulate; the prosternum, keel finely punctulate; the mesosternum emarginate, stria complete anteriorly but not quite reaching the suture at the base; the anterior tibiæ 5-6-denticulate.

The absence of a frontal stria is a marked distinction in this species; hitherto *H. planiceps*, Lew., from Burma, was unique in this respect, but one of the American species, *fractifrons*, Cas., has a broken stria, showing a tendency to lose it. In my example of *fractifrons* the fourth and fifth dorsal striæ are joined, but as Casey does not mention this, it may be a varying character both in it and *planifrons*.

Hab. Victoria, Vancouver Island (Wickham).

Atholus malaysi, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte obscure punctulata, stria semicirculari; pronoto utrinque foveolato, stria laterali interna basi abbreviata; elytris striis 1-4 integris, 5-6 dimidiatis, humerali brevi; mesosterno marginato; tibiis anticis multidenticulatis.

L. 4½ mill.

Oval, little convex, black and shining; the head obscurely punctulate, stria semicircular; the thorax, marginal stria interrupted behind the head, outer lateral wanting, inner abbreviated before the base, feebly crenate behind the neck, within the stria behind the anterior angle is a shallow fovea; the elytra, humeral stria short and bent and near the middle, 1-4 dorsal complete, 5-6 nearly dimidiate, but the sutural is slightly the longest; the pygidia are finely punctured with minute points in the interspaces; the prosternum is microscopically strigose, the anterior lobe has a strong lateral stria, but the apex is not marginate; the mesosternum is widely arched, with a fine crenate marginal stria, the sutural transverse stria is straight and also crenate; the anterior tibiae are denticulate on the outer edge and the denticulations are continued round the angle to the tarsus.

This species somewhat resembles *A. silvicola* and *baberii*, Lew.

Hab. Malacca Peninsula.

Tribalus cavernicola, Lewis, 1908.

Ovalis, supra subdepressus, subaeus, nitidus; fronte concava, supra oculos elevata, fero levis; pronoto basi transversim impresso; elytris striis obsoletis; prosterno striis utrinque divergentibus; antennis pedibusque obscure brunneis.

L. 3 mill.

Oval, somewhat depressed above, brassy, shining; the head concave anteriorly, with lateral margins elevated, surface almost impunctate; the thorax is evenly, finely, and rather closely punctulate, marginal stria complete, along the middle of the basal edge there is a narrow, transverse, rugose impression; the elytra, dorsal striae short, oblique, and ill-defined, disk and the pygidia are also smooth; the prosternum, lobe marginate, clearly punctured, and microscopically strigose, striae divergent before and behind, keel lightly sculptured; the mesosternum, marginal stria very fine and interrupted in the middle, evenly, sparingly, and very minutely punctu-

late, transverse stria well-marked with sixteen crenellations ; the antennæ pale brown ; legs obscurely brownish.

Similar in form and colour to *T. capensis*, Payk., but the surface-sculpture of Paykull's species is densely punctulate.

Hab. Usambara : Tangā, in the Mkulumusi caves.

Tribalus puncticeps, sp. n.

Breviter ovalis, supra convexus, niger, nitidus; fronte cum mandibulis punctulatis; pronoto irregulariter punctato, stria marginali integra; elytris stria suturali tenuiter impressa; tarsis ferrugineis.

L. 2 mill.

Shortly oval, convex above, black and shining ; the head, also the clypeus and mandibles, markedly and somewhat densely punctulate, forehead impressed ; the thorax, marginal stria complete and continued behind the neck, the disk very finely and sparingly punctulate, laterally the points are larger but not so densely set as those of the head, the scutellar depression is transversely but not conspicuously punctured ; the clytra, striæ, outer humeral fine and complete, the sutural very fine and not very distinct, abbreviated as usual in the genus, and it scarcely diverges from the suture anteriorly ; there are indications of other dorsal striæ and the dorsal punctuation is irregular with a tendency to run into double longitudinal lines ; the pygidia are much more finely and less densely punctulate than the head ; the prosternum, the anterior lobe is distinctly punctured, the keel nearly smooth and the lateral striæ very slightly diverge at either end ; the mesosternum anteriorly immarginate, sutural stria finely crenate and almost straight ; the tarsi are ferruginous.

The punctuation of the head is a marked character in this species.

Hab. Nilgiri Hills, 5000 feet (*H. L. Andrewes*).

Tribalus suturalis, sp. n.

Breviter ovatus, parum convexus, piceus, subopacus ; fronte punctulata haud impressa ; pronoto lateribus sinuato ; elytris striis humeralibus integris, dorsalibus inconspicuis, sutura post scutellum subtuberulata.

L. 2½ mill.

Shortly oval, little convex, piceous, and somewhat opaque ; the head closely punctulate, with a lateral stria before each eye, forehead not impressed ; the thorax sinuous along the lateral edge, where it is obscurely reddish, the marginal stria

is widely interrupted behind the neck, surface much less closely and less conspicuously punctured than the head and the points vary in sizes which are intermixed; the elytra, surface opaque by reason of a microscopical granulate sculpture, punctuation in the scutellar region very minute, in other parts similar to that of the thorax, behind the scutellum the two edges of the suture are raised and form a small tubercle, the two humeral striae are very fine but complete, 1 dorsal is traceable as complete, 2 as dimidiate, 3 is basal, somewhat oblique, and better defined than the two others; the pygidia are evenly, clearly, and somewhat closely punctulate; the prosternum, the lateral striae feebly diverge at both ends; the mesosternum is immarginate behind the keel and the sutural stria is crenate with about twenty crenulations.

In its general facies this species resembles *T. doriae*, Mars.
Hab. Palembang, Sumatra.

Tribalus laevidorsis, sp. n.

Ovalis, supra convexus, brunneus, nitidus; fronte punctata; pronoto stria marginali integra, basi transversa punctata; elytris levibus politis, stria suturali nulla; mesosterno stria marginali late interrupta.

L. 1½ mill.

Oval, convex above, brown and shining; the head impressed anteriorly, somewhat elevated over the eyes, but without an apparent stria, surface clearly but not closely punctured; the thorax, marginal stria well-marked, complete, and minutely crenate behind the neck, at the base in the scutellar region there is a conspicuous transverse band of punctures; the elytra, outer humeral stria fine and complete, near the humeral angle is a short, rather obscure, oblique stria, the others are wanting, surface and that of the thorax is brightly polished and the thinly set punctures microscopical; the pygidia have a similar surface; the prosternum, anterior lobe punctured, very narrowly marginate, keel bi-striate, striae divergent slightly at both ends; the mesosternum, the marginal stria is interrupted behind the prosternal keel, the transverse stria is slightly bent and consists of about 16–17 crenulations; anterior tibie gradually dilated to the tarsal end.

There is no known *Tribalus* similar to this.
Hab. Mountalvan, near Manila (E. Simon).

Tribalus bicarinatus, sp. n.

Breviter ovatus, parum convexus, undique grosse punctatus, niger,

nitidus; fronte concava; pronoto stria marginali integra; elytris striis 2 humeralibus integris, carinatis, cæteris nullis; prôsterno striae antice incurvatis.

L. vix 2 mill.

Shortly oval, rather convex, wholly punctured above and beneath; the forehead somewhat concave and raised over the insertion of the antennæ; the thorax, marginal stria complete and rather obscurely crenate behind the neck; the elytra, punctuation a little sparse in the scutellar region, both the humeral striae are complete and cariniform, dorsal striae wanting, apices longitudinally strigose; the pygidia are more densely and more finely punctured than the elytra; the prosternum, striae bend inwards before the suture, anterior lobe coarsely and rather roughly punctured, base of the keel less closely punctured; the mesosternum, anterior edge quite straight, transverse and narrow, sutural stria straight and a little irregularly crenate.

The two humeral striae are a marked character for this species.

Hab. Simla, N.W. India.

Tribalus unistrius, sp. n.

Breviter ovatus, parum convexus, undique punctatus, niger, nitidus; fronte impressa; pronoto stria marginali integra; elytris striis subhumerali externa integra, cæteris obsoletis; propygidio pygidioque dense punctulatis.

L. 2 mill.

Shortly oval, rather convex, wholly punctured above and beneath; the forehead impressed and raised over the antennæ; the thorax, stria complete and obsoletely crenate behind the head; the elytra, outer humeral stria complete and somewhat cariniform, inner humeral is short and only just traceable in the middle, the first and second dorsal striae (or what apparently represents them) are traceable but very short, not reaching the base nor the middle, the humeral area and the outer part of each elytron is obscurely reddish; the pygidia are densely and finely pointed; the prosternum, anterior lobe coarsely not densely punctured, striae very slightly turned towards anteriorly, basal edge of the keel narrowly smooth; the mesosternum feebly sinuous anteriorly, transverse and narrow, sutural stria straight and irregularly crenate.

Hab. Kashia Hills, Anam.

Tribalus semen, Lew. Ann. & Mag. Nat. Hist. xiii. p. 137
(1884).

Brevitor ovatus, parum convexus, undique punctulatus, nigro-piceus, subnitidus; fronte leviter impressa, supra oculos elevata; pronoto stria marginali integra; elytris stria humerali externa integra haud carinata.

L. 2 mill.

Shortly oval, rather convex, rather finely and rather densely punctured, with the elytra finely strigose except on the disk; the forehead is feebly impressed and somewhat elevated over the eyes; the thorax, marginal stria complete and obscurely crenate behind the neck; the elytra, outer humeral stria complete, raised, but not carinate, and there are short traces of two dorsal striae; the pygidia are finely and densely punctulate; the prosternum, anterior lobe coarsely and somewhat rugosely punctured, keel less closely punctate, especially at the base, the striae turn slightly inward anteriorly; the mesosternum is not quite straight, being very slightly arcuate behind the prosternal keel, punctured like the keel, and very narrow and transverse, sutural stria rather widely and irregularly crenate.

The original notice of this species gave insufficient characters; it may be placed near *T. bicarinatus*, *unistrius*, and *cyclonotus*, Lew., but the last is a convex species; all are Oriental.

Hab. Kiga, Japan.

Pachycrærus atratus, sp. n.

Ovalis, supra parum convexus, niger, nitidus, punctulatus; fronte tenuiter impressa; pronoto undique punctato, stria marginali antice interrupta; elytris striis 1-4 integris, 5 dimidiata, suturali basi abbreviata; propygidio pygidioque grosse et dense punctatis; prosterno bistrati; mesosterno stria marginali integra.

L. $3\frac{1}{4}$ mill.

Oval, rather convex, black and shining; the head feebly impressed anteriorly, rather closely and finely punctured, stria complete but rather fine, especially in front; the thorax wholly punctate, closely laterally, rather less closely on the disk, marginal stria interrupted behind the head; the elytra, striae, outer humeral fine and dimidiate, inner wanting, 1-4 dorsal complete, 5 dimidiate, sutural shortened before the base, surface finely punctulate, with larger points along the apical margins; the pygidia are densely and coarsely punctured; the prosternum, keel bistriate, striae well-marked and

rather near together, they join anteriorly and widen out gradually to the base, but the interstice is narrow; the mesosternum is bisinuous and only moderately projecting in the middle, marginal stria complete but not close to the edge, on either side is an outer short bent stria, surface and that of the metasternum and first abdominal segment are finely punctulate; the anterior tibiæ are 5-denticulate.

This species may be placed near *P. puncticollis*, Lew., but the two species are not very similar.

Hab. Ghinda, Erythræa.

Phelister (Hister) præcox, Er. Wieg. Arch. i. p. 91 (1847).

"*H. ovalis, niger, nitidus, fronte impressa, prothorace marginato, latera versus punctulato; elytris rufo-piceis, fortiter striatis, striis interioribus duabus abbreviatis, tertia subintegra; ore, antennis pedibusque rufo-piceis.*

"Long. 1½ line."

Hab. Peru.

Phelister (Hister) pusio, Er. Wieg. Arch. i. p. 91 (1847).

"*H. rotundatus, niger, nitidus, fronte impressa, prothorace immarginato, latera versus punctulato; elytris subtilissime punctulatis, striis dorsalibus interioribus tribus abbreviatis, marginalibus nullis; antennis pedibusque rufo-piceis.*

"Long. 1½-1⅔ line."

Hab. Peru.

Phelister rectisternus, sp. n.

Breviter ovalis, parum convexus, niger, nitidus; fronte impressa, stria interrupta; pronoto stria lateralí integra, lateribus sparse punctata; elytris striis 1-2 integris, 3 in medio interrupta, suturali ultra medium abbreviata; propygidio distincte punctato; prosterno bistriato; tibiis antiosis 4-dentatis.
L. 3½ mill.

Shortly oval, rather convex, black and shining; the head impressed anteriorly, stria very fine and broken in the middle, each part being semicircular, surface microscopically and sparingly punctulate; the thorax, lateral stria crenate and somewhat distant from the edge, but continued close to the margin behind the neck, closely within the stria there are a dozen lateral punctures, surface punctulate like the head, scutellar fovea small and circular; the elytra, striae, outer humeral short, fine, and apical, inner wanting, 1-2 dorsal

complete and not deeply impressed, 3 broken in the middle, 4-5 wanting, sutural apical very fine, parallel to the suture, and just passing the middle; the propygidium coarsely and rather closely punctate; the pygidium finely and sparsely punctulate; the prosternum bistriate, stria bending slightly from each other, not joined at either end, and are a little shortened at the base; the mesosternum is straight anteriorly, with the marginal stria fine and close to the edge, second stria also fine, crenate, and feebly arched; the anterior tibiae are 4-dentate and the apical tooth obtuse.

Hab. S. Catharina, Brazil.

Phelister testudo, sp. n.

Suborbicularis, convexus, niger, nitidus, supra punctulatus; antennis pedibus quo rufis; elytris stria 1 basi abbreviata, striis 2-3 integris, 4 apicali brevissima, suturali dimidiata; prosterno parum lato, punctato, striis haud conjunctis; tibiis anticis 6-denticulatis.
L. 2½ mill.

Nearly orbicular, convex, black and shining, surface punctulate, antennæ and legs rufous; the head finely punctulate, frontal stria not continued anteriorly; the thorax is more distinctly punctulate than the head, lateral stria complete, with a minute fovea behind each eye close behind the stria, scutellar fovea circular; the elytra, striae crenate, 1 abbreviated apically, 2-3 complete, 4 very short, apical, but not close to the margin, sutural fine and nearly dimidiate, humeral striae are wanting; the pygidia are almost smooth, the punctuation being extremely fine; the prosternum, keel rather wide, with the surface and that of the lobe distinctly punctured, bistriate, striae not meeting at either end, and they widen out a little posteriorly; the mesosternum is bisinuous, marginal stria complete and follows the outline of the edge, the transverse or second stria is feebly arched anteriorly; the anterior tibiae 6-denticulate.

Superficially this species resembles *P. globiformis*, Mars., but the greater width of the prosternal keel is a marked distinction.

Hab. Parana (Donckier).

Phelister fractistrius, sp. n.

Ovalis, parum convexus, brunneus, nitidus; fronte impressa, stria integra in medio retrosum acuminata; pronoto stria laterali ad oculos producta; elytris striis 1-3 integra, 4 dimidiata, 5 brevi,

suturali basi abbreviata; propygidio grosse punctato; pygidio apice laevi; tibiis anticis 4-denticulatis.
L. 3 mill.

Oval, rather convex, brown and shining; the head impressed anteriorly, microscopically punctured, stria fine and acuminate in the middle; the thorax smooth, scutellar fovea circular, marginal stria fine, complete, and widely sinuous behind the neck, lateral stria well-marked and the interstices is somewhat wide, it ceases behind the eye and it is distinctly crenate near the anterior angles; the elytra, striae, humeral apical and abbreviated before the middle, 1-3 dorsal complete, 4 not quite dimidiate, 5 somewhat shorter, sutural extends just beyond the middle; the propygidium has rather large shallow punctures, rather closely set; the pygidium is smooth from the apex to the middle and punctured along the base; the prosternum is rather broad and without striae; the mesosternum, marginal stria very fine and nearly straight anteriorly, second stria is angulate on either side, very fine, and transversely slightly bent; the anterior tibiae are 4-denticulate.

Hab. Para, Brazil (H. H. Smith).

Phelister pygidialis, sp. n.

Ovalis, parum convexus, piceus, nitidus; fronte haud impressa, stria integra; pronoto impunctato, stria laterali post oculos interrupta; elytris striae 1-3 subhumeralique integris, 4-5 dimidiatis, suturali basi abbreviata; propygidio grosse punctato; pygidio circum sulcato.

L. 2 $\frac{1}{2}$ mill.

Oval, rather convex, piceous, shining; the head smooth, not impressed anteriorly, frontal stria well-marked, complete, and semicircular; the thorax impunctate and without a scutellar fovea, marginal stria fine and complete, lateral stria also fine and broken behind the eye, the detached portion behind the neck is crenate and turned backwards at both ends (resembling that of *P. friburgicus*, Mars., but the turned ends are longer); the elytra, striae, humeral fine and complete, 1-3 dorsal also complete, 4-5 apical and not quite dimidiate, sutural shortened at the base about one-third; the propygidium is coarsely, not densely punctate; the pygidium is densely and finely punctulate, with some larger punctures arranged transversely along its base, along the outer edge is a remarkable narrow bordering furrow, which is deepest behind the apex; the prosternum bistrigate, striae equidistant laterally and joined faintly at both ends; the mesosternum, marginal

stria nearly straight anteriorly, second stria widely arched : first segment of the abdomen bistriate laterally ; the anterior tibiæ are 6-denticulate.

In the curious furrow in the pygidium there is a great resemblance to those of *Saprinus ceneicollis*, Mars., and other South-American *Saprini*, but there is no other character to connect them ; the *Saprinini* seem to me to be wholly disconnected from all the other groups.

Hab. Paraguay (*Dr. Bohls*).

Phelister colombiae, sp. n.

Ovalis, convexus, niger, nitidus, elytris brunneis ; fronte impressa, stria antice interrupta ; pronoto stria laterali post angulos arcuata ; elytris striis 1-4 integris, 4 basi arcuata, 5 et suturali dimidiatis ; propygidio sparse punctato ; pygidio fere lœvi ; prosterno bistrato, striis haud conjunctis ; tibiis anticis 6-7-denticulatis.
L. $2\frac{1}{2}$ - $2\frac{3}{4}$ mill.

Oval, convex, black and shining, elytra reddish brown, colour somewhat obscure on the disk ; the head, forehead impressed, surface finely punctulate, stria interrupted ; the thorax punctulate like the head, with five or six larger punctures well within the lateral margin, marginal stria complete and behind the head crenate, lateral stria hamate behind the angle and ceasing behind the eye, scutellar fovea circular in outline ; the elytra, striae 1-4 complete, fourth arched at the base but not quite reaching the suture, 5-6 equal, dimidiate, and apical, outer humeral very fine, apical, and nearly dimidiate ; the propygidium somewhat irregularly and sparsely punctured ; the pygidium, punctuation very fine and scarcely visible ; the prosternum is bistriate, striae not joining at either end, but bend towards each other from the base ; the mesosternum is markedly bisinuous, marginal stria complete and crenate, the second stria is widely arched and also crenate and prolonged laterally to the posterior coxae ; the legs are reddish and the anterior tibiæ 6-7-denticulate.

Hab. Pischindé, Colombia (*W. F. H. Rosenberg*).

Phelister rubricatus, sp. n.

Ovalis, convexus, niger, nitidus, elytris partim rufis ; fronte impressa, stria antice interrupta ; pronoto stria laterali post angulos arcuata, basi minime abbreviata ; elytris striis 1-5 integris, suturali ultra medium abbreviata ; pygidio fere lœvi ; tibiis anticis 6-7-denticulatis.

L. 2- $2\frac{1}{4}$ mill.

Oval, convex, black and shining, outer margins of the elytra red, at the base the colour reaches the third stria and gradually widens out to the apex; the head is somewhat irregularly, not densely punctured, forehead impressed, stria interrupted anteriorly; the thorax, marginal stria complete and crenulate and conspicuous behind the head, lateral stria well-marked and arched behind the anterior angle and ceasing behind the eye, and is shortened a little at the base, surface irregularly punctured, points largest within the lateral margin; the elytra, dorsal striae 1-5 complete, fifth feebly hamate at its basal end, sutural apical and abbreviated by one-third, outer humeral short and apical, inner wanting; the propygidium is evenly, not densely punctured; the pygidium is nearly smooth, the punctuation being microscopical; the prosternum is bistriate, the striae join at the base and are nearly parallel along the keel and not therefore joining in front; the mesosternum, marginal striae complete, crenate, and are shortened before the coxae, the second stria is also arched and crenate, but reaches the posterior coxae; the legs are reddish brown.

The coloration of this species somewhat resembles that of *P. haemorrhous*, Mars.

Hab. North America (Dane Co., Wis. 1899, and Eddyville, Ja., H. F. Wickham).

Phelister carinistrius, sp. n.

Ovalis, convexus, brunneus, nitidus; fronte stria integra antice fere recta; pronoto basi utrinque obliqua distincte striata; elytris striae cariniformibus, omnibus integris, 5 cum suturali basi juncta; tibiis anticis 8-9-denticulatis.

L. 2-2½ mill.

Oval, convex, brown and shining; the head sparsely and finely punctulate, not impressed, stria slightly carinate, complete, and widely transverse anteriorly; the thorax punctulate like the head, with a few larger punctures laterally, opposite the fourth stria is a basal, oblique, carinate stria; the elytra, humeral striae very fine and somewhat obscure, outer slightly broken in the middle, inner shortened at both ends, dorsal all complete and carinate, sutural and fifth join anteriorly, apical border punctulate; the propygidium finely and not closely-punctulate; the pygidium almost smooth, points being very fine; the prosternum, keel narrowed in front, striae joined anteriorly and widening out to the base; the mesosternum, striae marginal and transverse, both equally arched and parallel to each other, and so continue down to the base of the metasternum; the anterior tibiae are 8-9-denticulate.

The oblique basal stria or carina on the thorax seems to connect this species with *P. plicicollis* and *subplicatus*, Sch.

In *P. carinistrius* all the striae are more or less carinate.

Hab. Brazil.

Phoxonotus suturalis, sp. n.

Ovalis, convexus, piceus, nitidus; fronte utrinque marginata; pronoto stria marginali integra, tuberculis 4 basi; elytris sutura 1-tuberculata, stria 4^a 3-tuberculata; prosterno lato bistriato, striis antice divergentibus; mesosterno perspicue punctato, stria ad suturam irregulariter impressa.

L. 4 mill.

Oval, convex, piceous, shining; the head striae on either side, surface very finely punctured; the thorax, marginal stria complete, but extremely fine behind the head, with four transversely placed tubercles, the two inner ones being well-marked; the elytra, humeral striae carinate and complete, 1 dorsal apically shortened and somewhat indistinct at the base, 2-3 basal and not well-defined, 4 represented by three tubercles, the other striae are wanting, behind the scutellum there is a sutural tubercle common to both the elytra, surface finely and evenly but not closely punctured; the pygidia are punctured like the dorsum; the prosternum, striae carinate and gradually but widely diverge in front; the mesosternum is marginate anteriorly, clearly but not closely punctured, and the sutural transverse stria is fine and irregularly crenate; the tibiae resemble those of *tuberculatus*, Mars.

The sutural tubercle on the dorsum distinguishes this species from the four others known. *P. fryi*, Lew., has a sutural stria at the base of the mesosternum which is evenly and finely crenulate; *lectus*, Lew., has this stria faint and very irregular, and in *suturalis* it is irregular but clearly defined.

Hab. Obidos, on the Amazon River.

List of Fossil Histeridæ from the Tertiary Strata.

Compiled by T. D. A. COCKERELL, April 1908.

Hister amulus, Heer, Verh. Holl. Maatsch. Wet. xvi. 60,
4. iii. fig. 23 (1862).

" *H. breviter ovalis, niger, elytris fascia pallida transversa.*"

Oeningen, Baden (Upper Miocene).

Hister antiquus, Heer, *tom. cit.* 58, t. iii. fig. 17 (1862):

"*H. breviter ovalis*, pronoto lateribus unistriato, elytris dorso 5-striatis."

Oeningen, Baden (Upper Miocene).
Compared with *H. unicolor*, Fd.

Hister coprolithorum, Heer, *tom. cit.* 58, t. iii. fig. 19 (1862).

"*H. subquadratus*, deplanatus, elytris striis quatuor integris."

Oeningen, Baden (Upper Miocene).

Hister marmoratus, Heer, *tom. cit.* 59, t. iii. fig. 21 (1862).

"*H. breviter ovalis*, pronoto lateribus unistriato, lividus, elytris nigro-maculatis, abdomine lavigato."

Oeningen, Baden (Upper Miocene).

Hister maculigerus, Heer, *tom. cit.* 59, t. iii. fig. 22 (1862).

"*H. breviter ovalis*, clytris nigris, pallido fasciatis, abdomine punctulato."

Oeningen, Baden (Upper Miocene).

Hister mastodontis, Heer, *tom. cit.* 57, t. iii. fig. 16 (1862).

Oeningen, Baden (Upper Miocene).

Said to be very like *H. major*, L.; therefore probably a *Macrolister*.

Hister morosus, Heer, *tom. cit.* 60, t. iii. fig. 24 (1862).

"*H. unicolor*, mandibulis rectis, pronoto anterius valde angustato, utrinque unistriato."

Oeningen, Baden (Upper Miocene).

Hister cadaverinus *, Schöberlin, Soc. Entom. iii. 42 (1888).
—Not Hoffm., 1803.

Oeningen, Baden (Upper Miocene).

* [This name may remain, as *cadaverinus*, Hoffm., 1803, = *impressus*, F., 1801.—G. Lewis.]

Hister vetustus, Heer, Verh. Holt. Maatsch. Wet. xvi. 58, t. iii. fig. 18 (1862).

"*H. broviter ovalis*, pronoto lateribus unistriato, elytra quinquestriatis, stria suturali nulla."

Oeningen, Baden (Upper Miocene).

Note.—Histeridæ have been reported from Baltic amber and from the Miocene shales of Florissant, Colorado, but have not been described. The Florissant specimens, collected by Scudder, are in the Museum of Comparative Zoology, Cambridge, Massachusetts. Among the fossils collected by the University of Colorado expeditions I have not as yet observed any Histeridæ; but very few of the Coleoptera have been critically examined.—T. D. A. C.

XVI.—*The Hybrid between the Bream and the Rudd* (*Abramis brama* × *Leuciscus erythrophthalmus*). By C. TATE REGAN, M.A.

[Plates VII. & VIII.]

FOR some time I have been trying to improve the series of British freshwater fishes in the National Collection; several anglers and others have helped forward this project by sending char, pollan, vendace, &c., and I am especially indebted to Major H. Trevelyan, from whom I have received a number of fishes from Lough Erne, including several which I regard as hybrids between the bream and the rudd (*Abramis brama* × *Leuciscus erythrophthalmus*).

Smitt ('Scandinavian Fishes,' p. 782) has noted that the rudd is fond of joining as an interloper in the spawning of other fishes (roach, bleak, and white bream), with the result that hybrids are produced. Little appears to be known about the hybrid between the rudd and the common bream, which is in every respect intermediate between the parent species, as may be seen from the subjoined description.

Abramis brama × *Leuciscus erythrophthalmus*.

Pharyngeal teeth compressed, hooked, entire or more or less crenate, in one or two series, 5—5 to 2.5—5, 2*.

* 5—5 in one specimen, 1.5—5.1 in six, 1.5—5.2 in one, 2.5—5.2 in one, of nine examined.

Depth of body $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length, length of head $4\frac{1}{2}$ to $4\frac{3}{4}$. Snout as long as or longer than the diameter of eye, which is $4\frac{1}{2}$ to $5\frac{1}{2}$ in the length of head; interorbital width $2\frac{1}{2}$ to $2\frac{1}{4}$ in the length of head. Mouth oblique; jaws equal anteriorly or the lower the shorter; maxillary extending to below the nostrils, or slightly beyond. Dorsal 11-13, with 8-10* branched rays; base above the interspace between pelvic and anal fins; free edge straight or concave; longest ray nearly as long as the head. Anal 18-21, with 15 to 18* branched rays; free edge emarginate. Pectorals as a rule not reaching the pelvics, which do not usually extend to the vent. Caudal forked, the lower lobe the longer. Lateral line decurved, running at about $\frac{1}{3}$ the height of the body in the middle of the length of the fish. 46 to 50 scales in the lateral line, $9\frac{1}{2}$ to $10\frac{1}{2}$ in a transverse series from origin of dorsal fin to lateral line, $3\frac{1}{2}$ to $5\frac{1}{2}$ between lateral line and base of pelvic fin. Sides more or less silvery; back darker; fins dark greyish.

Fourteen specimens in the British Museum measure from 230 to 340 mm. in total length (to the end of the middle rays of the caudal fin). Nine of these have been sent from Lough Erne during the last three years by Major Trevelyan; three from Colebrooke, Upper Lough Erne, were received from Sir Victor Brooke in 1871; one from Thetford was presented by Dr. Günther in 1879; and one is a skin from Yarrell's collection.

According to Major Trevelyan, this hybrid is known to the Lough Erne fishermen by the name of "white roach," in contradistinction to the "red roach" or "rudd." The largest specimen sent by him (330 mm.) weighed 2 pounds, but he has good reason to believe that specimens of $2\frac{1}{2}$ pounds weight have been taken.

The comparative abundance of these fishes in Lough Erne is rather remarkable, and it would be of interest if anything could be ascertained as to their breeding, whether they are fertile together, &c.

Those characters of the parent species and of the hybrid which can be numerically expressed may be presented in tabular form, thus:—

* Of fourteen specimens, twelve have 9 branched rays in the dorsal fin, one has 8, and one 10. Four have 18, seven 17, two 16, and one 15 branched rays in the anal fin.

	Bream.	Hybrid.	Rudd.
Pharyngeal teeth	5-5	5-5 to 2.5-5.2	2.4-5.3 to 3.5-5.3
Branched rays in dorsal fin	(8) 9 (10)	(8) 9 (10)	8-9 (10)
" anal "	23-29	15-18	10-12
Scales in the lateral line	49-57	46-50	39-44
" between origin of dorsal fin and lateral line	11-14	9½-10½	7-8
" between lateral line and base of pelvic fin	6-7	3½-5½	3-4
Vertebrae	43-45	42	37-39

Yarrell's skin, and the specimens from Colebrooke and Thetford had been determined as *Abramis blicca* (white bream or bream-flat), a species of which the exact distribution in the British Isles is not yet satisfactorily made out, but which does not seem to occur in Ireland. The white bream is in many respects intermediate between the rudd and the bream, but differs from the hybrid above described in the less oblique mouth, larger eye, different pharyngeal dentition (teeth usually 2.5—5.2), different number of fin-rays (dorsal with 8 branched rays, anal with 19 to 24), and higher position of the lateral line (at $\frac{2}{3}$ or more of the height of the body in the middle of the length of the fish). The number of scales in the lateral line (45 to 50) is practically the same, but in a transverse series there are often fewer above and more below the lateral line ($\frac{6-10}{6-6}$ instead of $\frac{9-10}{8-5}$).

The hybrid bream and rudd is also very similar to the hybrid bream-flat and rudd, which differs from it in the same way that the bream-flat does from the bream, i. e. in the smaller size (maximum length 250 mm.), the larger scales (40 to 46 in the lateral line, 8 or 9 between origin of dorsal fin and lateral line, 4 or 5 between lateral line and base of pelvic fin), fewer fin-rays (dorsal usually with 8, anal with 12 to 17 branched rays), and more numerous pharyngobranchial teeth (3.6—5.8 to 2.5—5.2). The mouth is less oblique and extends further back, whilst the lower caudal lobe is scarcely longer than the upper. The silvery body, pale fins, and large eye also appear to be characteristic. This hybrid (*Abramis blicca* \times *Leuciscus erythrophthalmus*) is represented by two specimens in the British Museum (Günth. Cat. Fish. vii. p. 233, 1868), and has been described by a number of continental authors. Fatio's detailed account (Faun. Vert. Suisse, iv. p. 376, 1882) and Smitt's description, accompanied by an excellent figure ('Scandinavian Fishes,' p. 807, fig. 200, 1895), may be specially mentioned.

Although not uncommon on the Continent, this hybrid

does not appear to have been recognized in England. It may perhaps be found in the midland and eastern counties (Trent, Ouse, Cam, &c.), where the bream-flat is known to occur.

It seems scarcely necessary to compare the hybrid bream and rudd with the well-known bream and roach hybrid (*Abramis brama* × *Leuciscus rutilus*), originally described under the name *Abramis buggenhagii*, which is at once distinguished by the more elongate body and the nearly horizontal or slightly oblique mouth. Thompson's record of *A. buggenhagii* from near Belfast (Nat. Hist. Ireland, iv. p. 187) evidently refers to one of the hybrid bream and rudd described above.

EXPLANATION OF THE PLATES.

PLATE VII.

Abramis brama × *Leuciscus erythrophthalmus*.

PLATE VIII.

Abramis blicca × *Leuciscus erythrophthalmus*.

XVII.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825–1830.* By J. C. MOULTON, of Magdalen College, Oxford.

[Continued from ser. 8, vol. i. p. 42.]

VI. *NYMPHALINÆ.*

MR. J. C. MOULTON, of Magdalen College, Oxford, has at my suggestion continued Miss Cora B. Sanders's valuable account of the Brazilian Rhopalocera in the Burchell Collection. In our attempts to solve the numerous difficulties which have arisen I have had abundant evidence of the skill and untiring care which he has devoted to this most important and interesting work. E. B. POULTON.

THE following paper forms the continuation of the valuable publications by Miss Cora B. Sanders, ending with No. V.

Brassoliniæ, in ser. 8, vol. i. (Jan. 1908) Ann. & Mag. Nat. Hist. pp. 33-42. The genera have been placed in the order of Godman and Salvin's Lepidoptera Rhopalocera in the 'Biologia Centrali-Americanæ.' As on previous occasions, much kind help has been afforded in the identification of several specimens by Mr. F. A. Heron, of the British Museum. The species of the genus *Anaea* were kindly determined for the Hope Department by Mr. Herbert Druce, F.L.S.

The arrangement of numbers and dates is carefully explained in Ann. & Mag. Nat. Hist. ser. 7, vol. xiii. (April 1904) pp. 309, 310. The following additional statements are quoted from ser. 8, vol. i. p. 34:—"Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality." "When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. 'a.' and 'p.' associated with the date stand for 'A.M.' and 'P.M.'"

One or more specimens of each species have been compared with the British Museum series, and in the case of any doubt with the Godman-Salvin Collection also.

Westwood's list of Burchell's Nymphalidæ, which corresponds to the subfamily Nymphalinæ, contains 101 numbers. All of these do not, however, refer to Nymphalinæ, as there are four numbers (N. 47, N. 47*, N. 55, and N. 56) devoted to two Danainæ (*Anosia erippus*, Cr., and *Tusitia gilippus*, Cr. (140-187), one (N. 39) to a *Libythea*, and two (N. 18 = 446-450, N. 20* = 451) to two Brassoliniæ. On the other hand, copies of the data of the following Nymphalinæ have been obtained from his list of "Burchell's Acræa, etc.":—The numbers A. 5, A. 6, A. 7 refer to three species of *Eresia*, A. 11 to *Victorina stelenes*, Linn., A. 15, A. 16 to two species of *Colænis*, A. 19 to *Metamorpha dido*, Linn., A. 20, A. 22 to two species of *Dione*. The dates of the specimens under four numbers of the list of Acræinæ &c. are very incomplete; but two small slips of paper in Westwood's handwriting give a full list of the dates which should have appeared under two of these, namely *Dione juno*, Cram., and *Metamorpha dido*, Linn. It seems probable that there were two other lists, probably on slips of paper equally small, for the two remaining species, *Dione vanillæ*, Linn., and *Colænis julia*, F., and that these have since been lost. One date has been obtained from Westwood's list of Erycinidæ (E. 70, *Phyciodes dicoma*, Hew.) and one from his list of Morphinæ (M. 21, *Prepona*

antimache, Hübn.). Of the 101 numbers given, all are accounted for except two, viz. N. 20 and N. 73, the former of which mentions one specimen dated 21. 2. 26, and the latter five specimens dated 12. 3. 26, 7. 11. 25, 913. 25. 10. 25 (two specimens), 11. 2. 26. This last number, N. 73, enclosed in parentheses, is placed in the middle of the genus *Catagramma*, and Westwood had written this name opposite the number, but afterwards erased it. These six specimens are unfortunately as yet untraced. Westwood's list of Nymphalinae is written in a clerk's handwriting, with notes as to names, including in a few cases a rough description, in Westwood's manuscript.

All obscure localities have been defined with reference to the map given in the Introduction to the Collections of W. J. Burchell by Professor E. B. Poulton, F.R.S., in Ann. & Mag. Nat. Hist. ser. 7, vol. xiii. pl. iii. J. C. MOULTON.

Oxford,
March 20th, 1908.

Protagonius drurii, Butl.

p. 2. 10. 27. = 454. Lanboso to Bréjo. Between Rio Corumbá, near Cataláo, and Bomfim.

Westwood's date agrees with the above, but he gives the name *Protagonius Hippona*.

Hypna clytemnestra, Cram.

Bz. 188. I. [8. 9. 25]. = 455. Rio de Janeiro. "Papilio. Along the Aqueduct."

30. 10. 25. = 456. Minas Geraës. "(In the forest). On the N.E. side of the arraial of São João de Nepomucéna."

7. 11. 25. = 457. Minas Geraës.

24. 12. 25. = 458. Rio de Janeiro. "Aqueduct (on the first hill on the left.)"

29. 12. 25. 2 = 459, 460. Rio. "Catombí—Bárra Vermelha—and Rio Comprido." Westwood's list gives another captured on this date.

14. 1. 26. = 461. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

26. 1. 26. 5 = 462-466. Morro de Ladéira and Catombí. "In a botanical and entomological excursion to the Barra Vermelha, Morro de Ladeira, and Catombí." Westwood's list gives another of this date.

27. 1. 26. 7 = 467-478. Rio de Janeiro.

31. 1. 26. = 474. Rio de Janeiro. "Valley of Catombí

and a high Mountain on the N.W. side of the Aqueduct." "All of this date were from off plants; mostly up the Valley of Catombi."

7. 3. 26. ♂ = 475, 476, 477. Rio de Janeiro. "At Catombi."
Bz. + 7. 3. 26. ♀ = 478, 479.

Westwood's list gives five more captured on this date.

9. 3. 26. 5 = 480-484. Rio de Janeiro.

Westwood's list gives two more captured on this date.

10. 3. 26. 5 = 485-489. Rio de Janeiro.

12. 3. 26. = 490. Rio de Janeiro. "Aqueduct."

15. 3. 26. 2 = 491, 492. Rio de Janeiro. "Catombi, in plantis."

16. 3. 26. = 493. Rio de Janeiro. "In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

19. 3. 26. 2 = 494, 495. Rio de Janeiro. "In the valley of Catombi."

20. 3. 26. = 496. Rio de Janeiro. "Along the Carioca Aqueduct."

21. 3. 26. = 497. Rio de Janeiro. "Along the Carioca Aqueduct."

1. 4. 26. = 498. Rio de Janeiro. "In the valley of Catumbi."

Bz. + 1. 4. 26. = 499. Rio de Janeiro. "In the valley of Catumbi."

Bz. 3. 4. 26. = 500. Rio de Janeiro. "Along the Carioca Aqueduct."

Except for the additions mentioned above, Westwood's list agrees. The name *Hypna Clytemnestra* has been added in his handwriting.

The possibilities of a mimetic association between this species and *Gynæcia dirce*, L., are noted under that species (pp. 187, 188).

Anaea halice, Godt.

Bz. 27. 1. 26. ♂ = 501. "Catombi." Rio de Janeiro.

31. 1. 26. ♂ = 502. Rio de Janeiro. (As 474.)

7. 3. 26. 3 ♂ = 503, 504, 505. Rio de Janeiro. "At Catombi."

10. 3. 26. 2 ♂ = 506, 507. Rio de Janeiro.

Westwood's list gives this as *Paphia*, a synonym of *Anaea*, and his dates agree.

Anaea phidile, Hübn.

14. 2. 26. ♂ = 508. Organ Mountains.

7. 3. 26. ♀ = 509. Rio de Janeiro. "At Catombi."

Bz. 13. 3. 26. ♂ = 510. Rio de Janeiro.

Bz. 1. 4. 26. ♀ = 511. " " " In the valley of Catumbi."

Bz. + 25. 8. 27. ♂ = 512. Ollarsa to Rio Pardo.

27. 8. 27. ♂ = 513. Retiro. Just north of Rio Pardo.

p. 24. 8. 28. ♂ = 514. At Retiro. "All caught hovering and feeding on the excrement of some carnivorous animal in the virgin forest at Retiro." This is another Retiro between Goyaz and Jeraguá.

Westwood's list mentions one more of this date, and another individual captured 26. 1. 26, Rio de Janeiro. Opposite these numbers also he wrote *Paphia*.

Anaea amenophis, Feld.

Bz. + p. 26. 8. 27. = 515. R. Pardo to Cubatão. "Lepidoptera caught at the passage of the several streams this day." It should be noted that this Cubatão is far north of the place of the same name visited by Burchell from 3. 12. 26 to 17. 1. 27.

Bz. p. 24. 8. 28. 2 = 516, 517. At Retiro. (As 514.)

p. 24. 8. 28. 2 = 518, 519.

Westwood's list places this species, together with *Anaea oenomais*, Boisd., under the name *Paphia*, and mentions seven specimens captured p. 24. 8. 27; this is doubtless a copyist's error for p. 24. 8. 28, of which date there are six individuals, counting two of *Anaea oenomais*. It therefore appears that one individual has since been lost, either of *A. amenophis* or *oenomais*.

Anaea oenomais, Boisd.

p. 24. 8. 28. 2 = 520, 521. At Retiro. (As 514.)

See note on *Anaea amenophis*, Feld., above.

Anaea otrere, Hübn.

11. 2. 26. = 522. Organ Mountains—" (in a walk to ^{the} Ipé trees)."

The date in Westwood's list agrees. This and the remaining species of *Anaea* are given the generic name *Paph*

Anaea arginussa, Hübn.

Bz. p. 26. 8. 27. = 523. "In sylva in excr." R. Pardo to Cubatão. (As 515.)

p. 26. 8. 27. = 524. "In silva in excrem." R. Pardo to Cubatão. (As 515.)

p. 26. 8. 27. = 525. "In sylva insuper excremen." R. Pardo to Cubatão. (As 515.)

A specimen = 526, with two English labels, p. 26. 8. 27. "In silva in excrem., " and a. 29. 8. 27. Cérvo, north of R. Pardo (a. 29. 8. 27) or R. Pardo to Cubatão (p. 26. 8. 27). As below or as 515.

a. 29. 8. 27. 3 = 527, 528, 529. Cérvo. "In the forest ascending the Morro de Batataes. *Papilionides*. In this forest Butterflies literally swarmed and thousands might have been caught in one day. I never saw such abundance in my life before."

Bz. + a. 29. 8. 27. = 530. Cérvo. As above.

Westwood's list gives four individuals captured p. 26. 8. 27 and six on a. 29. 8. 27: probably the sixth individual of a. 29. 8. 27 can be accounted for by specimen 533 of the next species (*A. appias*), not otherwise referred to by Westwood, while the fourth of p. 26. 8. 27 is obviously represented by one of the labels on 526.

Anaea appias, Hüb.

Bz. 22. 3. 26 b. = 531. Rio de Janeiro. "Along the [Carioca] Aqueduct, to the head of the Valley of Laranjeiros." See note to *Prepona amphimachus*, no. 539.

Bz. + 25. 8. 27. = 532. Ollaria to Rio Pardo.

Bz. a. 29. 8. 27. = 533. Cérvo. (As 527.)

Westwood's list does not include this last specimen with the others. It is probably entered under the last species, and accounts for the missing specimen of this date.

Siderone ide, Hüb.

Bz. 221. I. [19. 9. 25]. = 534. Rio de Janeiro. "*Papilio (Colias)*. Caught in vicinity of Botafogo bay. Given me by Mr. Heatherly."

Westwood's name and date agree.

Siderone (Zaretes) elllops, Linn.

p. 24. 8. 28. = 535. At Retiro. (As 514.)

Westwood's date agrees.

The specimens stand under the name *Paphia*.

The series in the British Museum is placed under the generic name *Zaretes*, but in the Godman-Salvin Collection *Siderone* is retained. In their book this genus is divided into *Siderone A* and *Siderone B*.

Cæa acheronta, F., = *cadmus*, Cram.

Bz. + 898. I. 25. 10. 25. = 536. Minas Geraës.
" *P[apilio]*. At Discoberto, near João Pedro's house."

Bz. + 16. 2. 26. = 537. Organ Mountains.

Westwood's list gives three more specimens, captured 4. 11. 25, 10. 11. 25, 10. 1. 26 (Rio de Janeiro and neighbourhood).

Aganisthos orion, F.

Bz. + 31. 10. 25. = 538. Minas Geraës. "On the road between Nepomucena and Domingos Ferreira's."

Westwood's list includes three more specimens captured 10. 3. 26 Rio de Janeiro, 31. 8. 27 Veravinha, between Rio Pardo and Rio Grande, 26. 1. 29 Porto Real (Porto Nacional). In his list Westwood gives Burchell's number 1297 under this last date, and we may therefore conclude that Burchell was speaking of *A. orion* in the following passage from his Brazilian note-book :—

" 1297 *Papilio*. The nature of this seems carnivorous as it frequently returned and settled on the skin of the Porco do Matto." Mr. Oldfield Thomas, F.R.S., kindly informs me that two forms of Peccary (*Tayassu tajacu* and *T. albirostris*) occur in the locality and that either might be called "Porco do Matto."

Prepona amphimachus, F.

9. 3. 26. ♀ = 539. Rio de Janeiro.

Westwood's list places this species and *Prepona pheridamas*, Cram., under one number, N. 16, and includes another individual captured 22. 3. 26 b. On this latter date Burchell went "along the Aqueduct to the head of the Valley of Laranjeiros," and his Brazilian note-book on this date reads :—" Along the Carioca Aqueduct. Those marked b were purchased from some negro-insect-catchers, who caught them all in this spot, and almost all were alive when I bought them."

Prepona antimache, Hübn.

1273. 4. 12. 28. = 540. Porto Real [Nacional]. " Walk to the Igarapé"; and his Brazilian note-book has the following passage in reference to this number :— "*Papilio*—In the forests by the Iguapé*, hovering low between the brushwood."

* The spelling differs in Burchell's two note-books.

Burchell gives a similar note on a specimen (406) of *Morpho achilles*, L., caught 5 p. 7. 9. 28 between Jeraguá and Cavalcanti, a little south of Porto Real. It reads thus:—“*Papilio*. This species hovers low among the brushwood in shady deep forests and is not easy to catch.” The general resemblance of the upperside of this *Prepona* and its congeners to *Morpho achilles*, L., suggests a possible mimetic association between the two, which is still further borne out by this note of Burchell's as to the similarity of their habits. The broad iridescent blue band which is so characteristic of both is probably the one conspicuous feature when they are on the wing, and thus an enemy would be less likely to notice the difference in size.

Westwood placed this date, without 1273, in his list of Morphinæ, but corrected the mistake afterwards, writing “an var. Nymph. 16”, which refers to 539 and 541.

Prepona pheridamas, Cram.

Bz. + 855. I. 24. 10. 25. ♂ = 541. Minas Geraes. “*Papilio*. About João Pedro's, at Discoberto: at the margin of the forest.”

See note on *Prepona amphimachus*, no. 539. This specimen bears two English labels as well as one Brazilian.

The underside of this specimen differs in a remarkable way from that of any individual of the same species in either the British Museum, Godman-Salvin, or Hope Collections. The upperside is, however, identically the same, and the fact that the closely related genus *Charaxes* is extremely variable on the underside also supports the conclusion that the specimen is merely an interesting variety. This view is endorsed by Mr. R. Trimen, F.R.S., who has very kindly examined the specimen. Being unrepresented in any of the above-mentioned collections, a brief description may be of interest:—

Underside. Reddish ochre, with centre rather lighter. *Fore wing*: from base to apex of cell two patches of ground-colour bordered externally by white margins, succeeded by a thin, zigzag, dark brown line; a third patch follows this one, bordered first by a thin brown line, then again by a white edging, a combination which continues downwards to the first median nervule. *Hind wing*: central portion, ground-colour mixed with white, giving a striolated appearance. From junction of costa and hind margin to nearly halfway along the second radial nervule a darker patch of ground-colour joining hind margin and continuing to a point at end of third median nervule. An ill-defined trace of band of

ground-colour bordered by thin zigzag brown line and white edging starts from costa, losing itself in central portion at median nervure. Between each nervule and in a line parallel to the hind margin six ill-defined white spots; the sixth, between the second and first median nervules, is larger, not so white, and has a brown spot in the centre. The remainder of the hind margin to anal angle is of the lighter tint.

Compared with an average specimen presented by Godman and Salvin to the Hope Collection the following are the chief points of difference:—The whole ground-colour is a greenish-ochre; the brown lines, many of which are so thin and indistinct in Burchell's specimens, are much more marked in the ordinary type; in the hind wing the band of ground-colour is bounded by a dark line which is prolonged beyond the third median nervule across the second and first almost to anal angle, and followed by the white all the way. The white spots of Burchell's specimen are, however, hardly traceable in the type. Again, the brown spot in discoidal cell is far more strongly marked in both wings than in the variety, in the hind wing of which it is, indeed, necessary to use a lens to find any trace of this discocellular spot. Against this, however, the brown spot in the lower part of the hind wing is hardly traceable in the type. The central portion of the hind wing is also less occupied by lighter colour, inasmuch as the ground-colour from base and hind margin converges more towards the centre than in this interesting variety.

Chlorippe agathina, Cram.

Bz. + 2 p. 5. 5. 29. ♂ = 542. On the Rio Tocantins, north of Porto Real (Nacionale). "Red Clay-slate cliffs", at Sucuri.

Westwood's list agrees. He gives the name as *Apatura*.

Chlorippe vacuna, Godt.

12. 3. 26. ♂ = 543. Rio de Janeiro. "Aqueduct."

13. 3. 26. ♂ = 544. "

13. 3. 26. ♀ = 545. "

Against this last specimen Westwood wrote "*Apatura* ♀?", and he had separated it as a different species under another number.

a. 24. 8. 28. ♂ = 546. At Retiro (between Goyaz and Jeraguá). "All at the rivulet near the house at Retiro."

Westwood's list reads a. 24. 8. 27, which is obviously a clerical error for this date. His dates otherwise agree. He

placed this species under the same number as 542, with the generic name *Apatura*.

546 is very like the other 2 ♂♂ of Burchell's series, but differs from them and a series in the British Museum from Brazil and Paraguay in this respect, namely, that the sub-apical brown spots are much smaller and more separated. There are no ♀♀ in the Godman-Salvin Collection, but the ♂♂ in it agree with specimens 543, 544 mentioned above.

Chlorippes laurentia, Godt.

a. 29. 8. 27. 5 ♂ = 547-551. Cérvo. (As 527.)

Bz. + 30. 8. 27. ♂ = 552. Between Rio Pardo and Rio Grande. "On the road between Paciencia and Veravinha."

Westwood's list gives these under the name *Apatura*, and his dates agree.

Chlorippes linda, Feld., = *plesaurina*, Butl.

Bz. + 25. 8. 27. ♂ = 553. Ollarsa to Rio Pardo.

Bz. + 12. 4. 29. ♂ = 554. Porto Real (Nacionale).

9. 5. 29. ♂ = 555. Near Alcântara on the Rio Tocantins, S. of Carolina. "(See the view—with the boat.)"

Westwood's list agrees, and he named these *Apatura* also.

Chlorippes linda, Drury, a mimic of *Adelpha nea*, Hew.

On the upperside this *Chlorippes* departs in both sexes from the usual pattern and colouring of its genus, and assumes the regular *Adelpha* pattern of white band, breaking into orange in the fore wing, on a dark brown background. Of the three specimens caught by Burchell, two were taken a little south of Pará. These exactly resemble in pattern a single specimen of *Adelpha nea*, Hew., also taken by him at Pará, though three months later. The chief points to be noticed are:—the shape of the orange band in the fore wing, which is pinched in at the apex of the discoidal cell in *nea*, while in *linda* the apical portion is separated by a narrow interval from the rest of the band. The white band, however, continues downwards of exactly the same width and shape, and the orange patch at anal angle in *nea* is reproduced in *linda* by a rather narrower streak. The shape of the fore wing of *linda* is rather less hooked than in the other species of *Chlorippes*, thus following the straighter hind margin of the *Adelpha*. We may thus safely conclude that *Adelpha nea*,

Hew., which possesses a typical *Adelpha* pattern, is the model, and that *Chloripphe linda*, Drury, which departs so much from the true *Chloripphe* pattern, is the mimic. Another point worthy of notice is the prolonging of the white band of the hind wing well into the fore wing in Burchell's third specimen of *Chloripphe linda*, caught (25. 8. 27) two years earlier a good deal further south near the Rio Pardo. On this very date Burchell caught a specimen of *Adelpha* nr. *abia* (no. 601), in which a noticeable feature is that the white band is prolonged well into the fore wing. Although this latter species is much smaller than *Adelpha nea*, it seems possible that its presence in the south influences the southern *Chloripphe linda* by drawing it away from its northern model, *Adelpha nea*, in this one characteristic.

It should be noted that the mimicry does not extend to the undersides, which are very different.

Adelpha erotia, Hew., form of or species very near.

Bz. 9. 3. 26. = 556. Rio de Janeiro.

Westwood's date agrees. He had named this *Heterochroa lerna*. The generic name is a synonym of *Adelpha*; and is used in the British Museum.

No. 556 appears to be nearest to two specimens from British Guiana in the Godman-Salvin Collection, and it resembles in a lesser degree a long series from S. Paulo, Paraguay, &c. unnamed in the same collection. Burchell's specimen is perhaps the same as *A. phylacides*, Stdgr., from the Upper Amazons, also in Godman-Salvin Collection. In the British Museum the nearest approach to it is *A. thesprotia*, Feld., which most resembles the Godman-Salvin specimens from Paraguay.

Adelpha cocala, Cram.

31. 1. 26. = 557. Rio de Janeiro. (As 474.)

Westwood's date agrees. This he had named *Heterochroa Cocala*, var.

Adelpha cytherea, Linn.

Bz. 191. I. [8. 9. 25]. = 558. Rio de Janeiro. "Papilio. Along the Aqueduct."

4. 11. 25. 2 = 559, 580. Minas Geraes. At Francisco Manoel's. "Some tropeiros from the rancho seeing me catching Papilionides, caught a few also for me. I afterwards ascended the hill into the forest northward of our Rancho and took insects, till wet through in a

thunder shower. In the evening caught some insects by the candle."

24. 12. 25. = 561. Rio de Janeiro. "Aqueduct (on the first hill on the left)."

9. 3. 26. = 562. Rio de Janeiro.

10. 3. 26. = 563.

Bz. 12. 3. 26. 3 = 564, 565, 566. Rio de Janeiro. "Aqueduct."

12. 3. 26. = 567. Rio de Janeiro. "Aqueduct."

Westwood's list adds another specimen captured on this date.

13. 3. 26. = 568. Rio de Janeiro.

15. 3. 26. = 569. " " Catombi, in plantis."

18. 3. 26. 2 = 570, 571. " " Along the Carioca Aqueduct."

20. 3. 26. 2 = 572, 573. " " Along the Carioca Aqueduct."

Bz. 20. 3. 26. = 574. " " Along the Carioca Aqueduct."

21. 3. 26. = 575. " " Along the Carioca Aqueduct."

Bz. 21. 3. 26. = 576. " " Along the Carioca Aqueduct."

Westwood's list adds another specimen captured on this date.

Bz. 22. 3. 26. 2 = 577, 578. Rio de Janeiro. Along the Aqueduct, to the head of the Valley of Laranjeiros.

1. 4. 26. = 579. Rio de Janeiro. "In the valley of Catumbi."

3. 4. 26. 2 = 580, 581. Rio de Janeiro. "Along the Carioca Aqueduct."

7. 6. 29. = 582. Sta. Anna. (On the Rio Tocantins, between Baio and Pará.)

Bz. + 1. 7. 29. = 583. Pará; walk to the Caza de Pao.

1. 7. 29. = 584. " " "

Bz. + 4. 7. 29. = 585. Pará.

20. 9. 29. = 586. Pará. S.E. of S. Joze.

Westwood's list of this species under the name *Heterochroa* adds one more individual captured in Minas Geraös 7. 11. 25. Except for the above additions his dates agree.

Adelpha mythra, Godt., = *zeba*, Hew.

8. 2. 26. 2 = 587, 588. Organ Mountains. " (In a ride to the Cattle Pounds and the Milho Roça.)"

Westwood had written "*Heterochroa*, same as N. 27"

opposite "N. 53," under which stands one of the two preceding specimens. On 588 he had written "*Het. Dionysa* Hewits? Ann."

11. 2. 26. 2 = 589, 590. Organ Mountains. (In a walk to the Ipé trees.)

Under "N. 27" Westwood had written *Heterochroa Mithra*, and his dates agree.

Adelpha syma, Godt.

9. 2. 26. 4 = 591-594. Organ Mountains. "(By the river Pacaqueé.)"

11. 2. 26. = 595. Organ Mountains. (As 589.)

This date had been originally written in a clerk's handwriting in Westwood's list of *Adelpha mithra*, but corrected to this species by Westwood himself.

12. 2. 26. = 596. Organ Mountains.

14. 2. 26. 2 = 597, 598. Organ Mountains.

10. 2. 27. = 599. S. Paulo. "Along the great Rio road for about 2 miles N.E."

18. 6. 27. = 600. Vicinity of S. Paulo.

Westwood's name and dates agree.

Adelpha sp. near *abia*, Hew., and perhaps a form of this species.

25. 8. 27. = 601. Ollaria to Rio Pardo.

a. 29. 8. 27. = 602. Cérvo. (As 527.)

30. 10. 27. = 603. Sapezal to Conceição, near Goyaz.

Westwood's list agrees, and the name *Heterochroa* is written opposite. These forms resemble a series, unnamed, in the British Museum. Compared with the Godman-Salvin Collection they closely resemble some specimens placed under *Adelpha abia*, Hew.

Adelpha abia, Hew.

27. 8. 27. = 604. R. Pardo to Retiro.

a. 29. 8. 27. 4 = 605-608. Cérvo. (As 527.)

9. 9. 27. = 609. Tenenté (just N. of the Rio Grande).

a. 24. 8. 28. = 610. Retiro. "All at the rivulet near the house at Retiro." (Between Goyaz and Jeraguá.)

25. 8. 28. = 611. Retiro to Goyavéira. "On the road." Near Goyaz.

Westwood's list adds another specimen captured p. 24. 8. 28 at Retiro. (As 514.) These he had named *Heterochroa Abia*.

Adelpha gerona, Hew.

25. 8. 27. ♂ = 612. Ollarfa to Rio Pardo.

Westwood's list gives this as *Heterochroa Gerona*, and his date agrees.

This specimen has a wider white band than the single specimen (♂) in the British Museum, which is Hewitson's type. There are none in the Godman-Salvin Collection.

Adelpha iphicla, Linn.

20. 3. 26. = 613. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. + 3. 4. 26. = 614. " " "Along the Carioca Aqueduct."

A Westwood's label on this specimen bears the following note:—"Het. *Iphicla* Linn. Drury 1 pl. 14 var. *Basilea* Cr. 188."

Bz. + 24. 3. 29. = 615. Porto Real (Porto Nacionale). Mângá.

Westwood's name is *Heterochroa Iphicla*, and his dates agree.

Adelpha lerna, Hew.

7. 9. 27. ♂ = 616. Cachoéira to Retiro. This is a third Retiro, probably quite close to the Rio Grande, as in his 'Catalogus Geographicus' the following entry is given for the next day:—"Cachoéira to Rio Grânde."

Westwood's name is *Heterochroa Lerna*, and his date agrees.

Adelpha plesaure, Hüb.

13. 3. 26. = 617. Rio de Janeiro.

21. 3. 26. = 618. Rio de Janoiro. "Along the Carioca Aqueduct."

Westwood's dates agree, and he had identified the genus as *Heterochroa*.

Adelpha serpa, Boisd.

27. 1. 26. ♂ = 619. Rio de Janeiro.

8. 2. 26. ♂ = 620. Organ Mountains. "In a ride to the Cattle Pounds and the Milho Roça."

Bz. 10. 3. 26. ♂ = 621. Rio de Janeiro.

20. 3. 26. ♀ = 622. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list agrees, and he names the species *Heterochroa Serpa*. His label on 620 bears the following note:—“*H. Serpa* Bd. *Iphiclus* Cr. 188.”

Adelpha nea, Hew.

7. 8. 29. ♀ = 623. Pará.

Westwood's date agrees, and against this he had written “*Heterochroa Nea* var. ?” A note on the mimetic association between this species and *Chlorippe linda*, Feld., is given under that species on pages 174, 175.

Pyrrhogryra crameri, Auriv.

Bz. + 22. 4. 29. = 624. Porto Real (Naçãoale).

Westwood's date and generic name agree.

Pyrrhogryra tipha, Linn., = *nearea*, Linn.

Bz. + 22. 4. 29. = 625. Porto Real (Naçãoale).

22. 4. 29. 2 = 626, 627.

Westwood's date and generic name agree.

Timetes (Megalura) chiron, F.

Bz. 559. II. [19. 10. 25]. 2 = 628, 629. Minas Geraës.
“*Papilio*.”

Bz. + 903. V. 25. 10. 25. 4 = 630-633. Minas Geraës.
“*Papilio*. At Discoberto, near João Pedro's house.”

Westwood's list adds another specimen of this date.

Bz. + 996. I. 27. 10. 25. = 634. Minas Geraës. “*Papilio*. At San João de Nepomucéna and on the road from Discoberto.”

28. 10. 25. 4 = 635-638. Minas Geraës. “In the Forest on the West and on the East side of S. João de Népomucéna.”

Westwood's list adds two more specimens captured on this date.

29. 10. 25. 2 = 639, 640. Minas Geraës. “In the forest on the S.E. side of S. João de Népomucéna.”

4. 11. 25. 5 = 641-645. Minas Geraës. (As 559.)

Bz. 12. 3. 26. = 646. Rio de Janeiro. “Aqueduct.”

Bz. 16. 3. 26. = 647. Rio de Janeiro. “In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos.”

Bz. 3. 4. 26. = 648. Rio de Janeiro. “Along the Carioca Aqueduct.”

Bz. 28. 11. 28. = 649. Porto Real (Nacional).

27. 5. 29. = 650. Arróyos; on the Rio Tocantins, between Itabóca and Baião.

Westwood's list omits one specimen dated 29. 10. 25, but adds another with the date 24. 10. 25. It is probable that "24" has been accidentally written for "29." Opposite this species Westwood had written "*Timetes Chiron*, Fab.; *Marius*, Cram."

Timetes (Megalura) coresia, Godt.

9. 2. 26. 2 = 651, 652. Organ Mountains. (By the River Pacaqué.)

Westwood's date agrees, and he identified the species as *Timetes Coresia*. On 651 he gives a label bearing the words:—"Timetes Coresia Godt., Zerynthia, Hb."

Timetes (Marpesia) peleus, Sulz.

4. 11. 25. 2 = 653, 654. Minas Geraës. (As 559.)

Westwood's list gives another specimen captured on this date.

p. 24. 8. 28. = 655. Retiro. (As 514.)

Westwood's dates agree, and he names this *Marpesia Thetys*, a synonym of *peleus*.

Amphirene (Sipræta) trayja, Hübn.

27. 8. 27. = 656. Retiro. (Just north of Rio Pardo.)

Westwood's date agrees, and he gives the name as "Minetra Trayga."

Victorina stelenes, Linn.

Bz. + a. 29. 8. 27. = 657. Cérvo. (As 527.)

Westwood's date agrees, though this appears under his list of Acræinæ. Opposite the number he had written:—"Junonia? brown with green spots."

Cystineura apicalis, Stdgr., n. subsp. *burchelli*.

Bz. 23. 3. 28. ♂ = 658. Goyaz. Sitio of Zacharsa.

Westwood's list makes this date to be 23. 4. 28.

Bz. 19. 9. 28. ♀ = 659. "Sylv. Tucantins." Rio Tucantins.

Bz. 16. 2. 29. ♀ = 660. Porto Real (Nacional). "Papiliones (3) caught on the flowers of a Malva in the back yard."

Col. Prain informs me that no specimen of this *Malva* exists in Burchell's Herbarium at Kew.

Bz. 22. 3. 29. ♀ = 661. Porto Real (Nacional).

24. 3. 29. ♂ = 662. Porto Real. Mângá.

Westwood's list agrees, except that it also includes 663.

This form is unrepresented in the British Museum and Godman-Salvin Collection. It may be regarded as a northern subspecies of *C. apicalis*, Stdgr., described as a South Brazilian insect.

Cystineura apicalis, Stdgr., n. subsp. *burchelli*.

Female (no. 661). Central ground-colour white, surrounded by fuscous-brown margins; some dull orange in apical area of fore wing. *Fore wing*: from base towards apex a broad costal fuscous border covering discoidal cell; beyond end of cell a white kidney-shaped spot, succeeded by apical fuscous patch, which itself encloses diffused dull orange in the centre; from the fourth subcostal nervule and in the centre of the orange patch a series of four internervular spots of fuscous ground-colour, with white centres increasing in size towards the last. Central portion of wing occupied by triangular patch of white, widening from third median nervule to inner margin. Two irregular, oblong, faint, white spots in discoidal cell running into ground-colour, with very slight trace of a third over the junction of the two. Hind margin with a border of rather darker fuscous, slightly serrated on inner side. Cilia white between nervules. *Hind wing*: subcostal band of fore wing continued across base of hind wing, succeeded by central patch of white. Hind-marginal band of fuscous rather broader than in fore wing; the actual margin marked by a darker line, preceded by an interrupted faint whitish line, both following the serration of the wing. From centre of inner margin to costa beyond middle a narrow, nearly straight, fuscous band, which almost loses itself in the white central patch at the second subcostal nervule, but continues again, indistinctly and slightly narrower, from the first subcostal nervule. Cilia as in fore wing.

Underside dull orange and white. *Fore wing*: same band from base towards apex as on upperside, dull orange instead of fuscous, marked by similar (but better defined) irregular white spots, and succeeded by rather larger kidney-shaped white spot, which is enclosed in the apical orange patch. A row of five white spots from costa between nervules to second median nervule, their central portion white as on upper surface, but better defined. Hind margin marked by

thin dark line, internally relieved by small indistinct white lunules. *Hind wing*: dull orange patch at base in continuation of band in fore wing. White central patch with dull orange band from inner margin to costa, broken, however, between first and second subcostal nervules. Hind-marginal band of dull orange, broadening at centre and narrow again at anal angle, more serrated than in fore wing and bounded by darker thin line relieved internally by larger white lunules.

Male (no. 662) differs slightly from the female in size, being rather smaller and having rather more pointed fore wings. Also the kidney-shaped white spot under the costa in the fore wing is a little smaller. On the underside the central patch of white in the fore wing is extended nearly to the apex, leaving only a narrow border of ground-colour lining the apex and hind margin. In the hind wing the dull orange band is continuous instead of being broken between first and second subcostal nervules as in female. In other respects the markings of the male are the same as in the female.

Type ♂ of *burchelli*, specimen 662, and type ♀, specimen 661, in Hope Department, University Museum, Oxford.

Distribution (based on the five specimens captured by Burchell). From Goyaz northwards to Porto Real (Nacional) on the Rio Tocantins: the interior of Eastern Brazil.

These differ from the series of *Cystineura apicalis*, Stdgr., in the British Museum and in the Godman-Salvin Collections chiefly in the absence of a large apical patch of dull orange in fore wing, which is characteristic of all specimens in those collections.

In two specimens from Casa Branca, S. Paulo, in the Godman-Salvin Collection the fuscous band in the hind wing is broader than in *apicalis* and is of equal width throughout. In depth of colour it resembles the hind-marginal border. The dull orange apical patch extends from the kidney-shaped white spot below the costa to the first median nervule, leaving a narrow serrated border to the hind margin. The white spots on the underside are less marked than in *burchelli*.

In six from Chapada, also in the Godman-Salvin Collection, the fuscous band across the hind wing tapers towards the costa as in *burchelli*, and in one individual is broken between the first and second subcostal nervules.

Two specimens from Paraguay (captured 1904 and 1905) in the British Museum have a more slate-coloured appearance, which is even more accentuated in two very fine specimens from Coroico, Bolivia, in the Godman-Salvin

Collection. With the aid of a lens it is at once seen that this is due to a fine dusting of white scales on the fuscous ground-colour. These seem to disappear in older specimens. The above-mentioned two specimens from Paraguay have a rather broader fuscous band in the hind wing, and in one female from Santa Cruz, Upper Paraguay River, the white in both wings is reduced to form two narrow bands.

Cystineura tocantina, Bates.

1316. 17. 2. 29. = 663. Porto Real (Nacional). "Feeding on the flowers of the Waltheria bushes (v. H. 8632 X)."

Col. Prain, F.R.S., kindly informs me that Burchell's "8632-2" is named *Waltheria ferruginea* ?, St. Hil., in the herbarium. Burchell's botanical catalogue contains these words:—"8632-2 *Waltheria* v. Cat. Entomol. Frutex 5-7-ped. ramosus. Corolla citrina, vel sulphurea."

Included under *burchelli* in Westwood's list. His date agrees.

This is unrepresented in the British Museum, but has been compared with specimens in the Godman-Salvin Collection.

Didonis biblis, F.

Bz. 141. III. [16. 8. 25]. 2 = 664, 665. Rio de Janeiro.

"*Papilio*. Above the ~~Terra~~ Convent; and on the woody hilly [hills] along the Aqueduct."

Westwood's list adds one more of this date.

4. 11. 25. = 666. Minas Geraes. (As 559.)

6. 12. 25. = 667. Rio de Janeiro. On the Corcovado Mountain. "In an excursion to the Summit of the Corcovado by the road by the Couvent of Sta. Theresa and along the Aqueduct."

Westwood's list adds another of this date.

31. 12. 25. 2 = 668, 669. Rio de Janeiro. On the Corcovado Mountain, and in the Valley of Laranjeiras. "Excursion to the summit of the Corcovado; from Catete and up the valley of Laranjeiros."

10. 1. 26. 2 = 670, 671. Rio de Janeiro. Praia Granda and S. João de Carahy. "At Praia Grande and vicinity, and about S. João de Carahy."

26. 1. 26. = 672. Rio de Janeiro. Morro de Ladéira and Catomby. "In a botanical and entomological excursion to the Barra Vermelha, Morro de Ladeira, and Catombi."

Westwood adds another of this date.

27. 1. 26. = 673. Rio de Janeiro.

Westwood's list adds two more specimens of this date.

7. 3. 26. = 674. "Catombi." Rio de Janeiro. "At Catombi."

7. 3. 26. = 675. Rio de Janeiro. "At Catombi."

Bz. 7. 3. 26. = 676. Another label attached to this specimen has the words:—"Duplicate Lepidoptera, selected from my Brazilian collection." Rio de Janeiro. "At Catombi."

Bz. 9. 3. 26. = 677. Rio de Janeiro.

16. 3. 26. = 678. " (As 647.)

Bz. 16. 3. 26. = 679.

27. 8. 27. = 680. Retiro. "Just north of" Rio Pardo.

30. 10. 27. = 681. Sapezal to Conceição; near Goyaz.

Bz. 25. 8. 28. = 682. Retiro to Goyavéira. "On the road." This Retiro is east of Goyaz, and the place mentioned on 514.

Westwood had written the name *Biblis*, and his list adds three individuals captured:—

14. 1. 26. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

19. 3. 26. Rio de Janeiro. "In the valley of Catombi."

20. 3. 26. Rio de Janeiro. "Along the Carioca Aqueduct."

Peridromia arethusa, Cram.

Bz. 194. I. [8. 9. 25]. = 683. Rio de Janeiro. Along the Aqueduct. "Papilio. In sylva."

1068. [3. 4. 26]. = 684. Rio de Janeiro. Along the Carioca Aqueduct. "Papilio: totimque nigra supra maculis cœruleis, subtus maculis rubris. This settles on the sunny smooth trunks of trees." [Other butterflies bearing the same number are:—*Papilio hectorides*, Esp., 1; *Papilio torquatus*, Cr., subsp. *polybius*, Swains., 1.]

1243. 7. 9. 28. 4 = 685-688. Rio Maranhão to Fe Guárda Môr. Between Jeraguá and Cavalcanti; near Rio Maranhão. "2 sp[ecies of] Papiliones caught against sunny side of trunk of a large tree on bank of the Maranhão. Wings expanded flat against the trunk."—"1243 conf. *Pap. arethusa*" [added later in pencil on blank page]. The other species is *Ageronia chloë*, Stoll.

Bz. + 1243. 7. 9. 28. = 689. Rio Maranhão to Fe Guárda Môr. As above.

Westwood's list gives two more specimens captured on this date. He gives the name "*Ang. Arete*" to one of the two numbers into which he had divided these specimens.

On 683 he had written "Agerona Arete Bd. Lucas. Arethusa Cram. 77 nec Arethusa Hb. Samml."

Opposite Burchell's species of *Peridromia* and *Ageronia* Westwood has accidentally written for the latter name that of the Geometrid genus *Angerona*.

Peridromia amphinome, Linn.

Bz. 351. I. [15. 10. 25]. = 690. Minas Geraës, "At the Discoberto do Antonio Velho." "P[apilio]. This species and the following [*Peridromia feronia*, Linn.] settle on the smooth sunny bark of the trunks of large trees, and when in their flight they meet another of the same species they appear to fight, and at the same time produce with their wings an extraordinary and loud and quickly repeated crackling noise."

The same fact was observed seven years later by Charles Darwin, and recorded in his 'Journal of Researches &c.,' London, 1876, pp. 33, 34 (Rio de Janeiro, 1832):—

"I was much surprised at the habits of *Papilio feronia*. This butterfly is not uncommon, and generally frequents the orange-groves. Although a high flier, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards; and its wings are expanded in a horizontal plane, instead of being folded vertically, as is commonly the case. This is the only butterfly which I have ever seen, that uses its legs for running. Not being aware of this fact, the insect, more than once, as I cautiously approached with my forceps, shuffled on one side just as the instrument was on the point of closing, and thus escaped. But a far more singular fact is the power which this species possesses of making a noise. Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me; and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch. The noise was continued at short intervals, and could be distinguished at about twenty yards' distance: I am certain there is no error in the observation."

See also Lepidoptera Rhopalocera of the 'Biologia Centrali-American,' F. D. Godman, F.R.S., and O. Salvin, F.R.S., vol. i. pp. 267, 268.

12. 8. 26. = 691. Rio de Janeiro. "Aqueduct."

Bz. 20. 3. 26. 2 = 692, 693. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list agrees, and the name he gives in it is *Angerona Amphionome*, Linn., which also appears in his handwriting on 691.

Peridromia feronia, Linn.

Bz. 352. I. [15. 10. 25]. = 694. Minas Geraës. "P[apilio]." At the Discobérto do Antonio Velho.

See Burchell's note to no. 690, which refers equally to this individual.

28. 10. 25. = 695. Minas Geraës. (As 635.)

29. 12. 25. = 696. Rio de Janeiro. Catombi, Bárra Vermélha, and Rio Comprido.

10. 1. 26. = 697. Rio de Janeiro. (As 670.)

14. 1. 26. = 698. " Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

27. 1. 26. = 699. Rio de Janeiro.

9. 3. 26. = 700.

10. 3. 26. = 701.

Bz. 15. 3. 26. = 702. " " " Catombi, in plantis."

Bz. 16. 3. 26. = 703. " " (As 647.)

16. 3. 26. = 704.

22. 3. 26. = 705. " " " Along the Carioca Aqueduct" "to the head of the Valley of Laranjeiros."

1. 4. 26. = 706. " " " In the valley of Catumbi."

26. 9. 26. = 707. Sântos. In a walk to the Chapel on Montserrat. "These *Papiliones* very plentiful in the woods. The white-spotted one settling on smooth bark on sunny side of trees, with outspread wings close to bark, and returning often to the same tree when disturbed."

1226. 16. 4. 28. = 708. Goyaz. Morro de Cantagállo. "Papilio. Settles with wings expanded against sunny side of trunk of tree in forest. Same manners and movements as its congeners."

23. 6. 29. = 709. Pará.

Westwood's list agrees, and he gives the name *Angerona Feronia*.

Peridromia epinome, Boisd.

28. 10. 27. = 710. S. Joaquim to Sapezal. Between Meia Ponte and Goyaz.

Bz. a. 24. 8. 28. = 711. At Retiro. (See 514.) "All at the rivulet, near the house at Retiro."

p. 24. 8. 28. 2 = 712, 713. At Retiro. (As 514.)

Westwood's list agrees, though he places this species with the next under the name *Angerona Ferentina*.

Ageronia ferentina, Godt.

Bz. + 29. 12. 25. = 714. On the Brazilian label is the following:—"Papiliones hujus generis insident in truncis nudis apricis." Rio de Janeiro, Catombí, Bárra Vermélha, and Rio Comprido.

14. 1. 26. = 715. Rio de Janeiro. (As 698.)

7. 3. 26. = 716. " " "At Catombí."

12. 3. 26. = 717. " " "Aqueduct."

Bz. 16. 3. 26. = 718. " " (As 647.)

3. 4. 26. = 719. " " "Along the Carioca Aqueduct."

1. 2. 30. = 720. Pará. In the forest S.S.E. of S. Jozé.

Westwood's list agrees. On 720 he had written "*Angerona Ferentina*, Godt."

Ageronia chloë, Stoll.

1248-2. 7. 9. 28. 3 = 721-723. Rio Maranhão to Fe Guárda Mór. (As 685.)

Westwood's list and name agree, except that he writes the generic name as *Angerona*. On 722 he had written "*Angerona Chloë*, Stoll."

Gynacia dirce, Linn.

10. 1. 26. 3 = 724-726. Rio de Janeiro. (As 670.)

Westwood's list gives another individual captured 7. 3. 26. Rio de Janeiro. "At Catombí." His name and dates otherwise agree.

The general resemblance on the upper surface between this species and *Hypna clytemnestra*, Cr., may prove to be of mimetic significance. On comparing the data on Burchell's specimens the following facts are evident:—Between Sept. 8th, 1825, and April 3rd, 1826, Burchell captured 54 specimens (by Westwood's list, see pp. 167-168) of *Hypna clytemnestra*, Cr., at Rio de Janeiro and its neighbourhood. Of these 46 can now be traced. In the same locality he took 4 specimens (of which we now possess 3) of *Gynacia dirce*, L., on the two dates Jan. 10th, 1826, and March 7th, 1826. From Westwood's list we gain still further evidence that the

two species are on the wing together; for he gives 10 specimens of *H. clytemnestra* caught March 7th, 1826, at Catomby, and one of *G. dirce* on the very same day. Five of the *clytemnestra* have unfortunately since been lost, as well as this single *dirce*.

The pattern, which consists of a dark fuscous background enlivened only by a broad yellow bar across the apex of the fore wing, stands out in each case from that which is found in the allied species. It is difficult, and perhaps impossible, to determine which of the two forms has acted as model; but in the case of *H. clytemnestra*, the species of the closely related genus *Protagonius* are invariably, although roughly, mimetic. Thus *Protagonius druri* mimics *Heliconius narcaea*. Hence it becomes probable that this propensity for mimicry is extended to *H. clytemnestra*. Burchell's specimens of *clytemnestra* without exception exhibit three yellow spots just beyond the subapical band of the fore wing; and these are absent in *dirce*. However, on comparing a series of each in the Hope Collection from Paraguay, I observed that the spots were in some cases reduced in *clytemnestra* and correspondingly present in *dirce*, as if the mimetic association was stronger in that part of the country.

It must be further noted that this is only a case of upper-side mimicry. The underside of *clytemnestra* is procryptically coloured, apparently for concealment among dead leaves, while the bolder pattern of *G. dirce* is adapted for the protective resemblance to tree-trunks on which it rests with upright wings (H. W. Bates in Lepidoptera Rhopalocera of the 'Biologia Centrali-Americanana,' F. D. Godman, F.R.S., and O. Salvin, F.R.S., vol. i. pp. 264-266).

Catagramma lyrophila, Hüb.

Bz. 286. I. [13. 10. 25]. = 727. Minas Geraës. Parahisbn.
"Papil[io] affinis præcedenti," viz. *Callicore clymene*,
Cram.

Bz. + 912. I. 25. 10. 25. = 728. Minas Geraës. "P[apilio]. At Discoberto, near João Pedro's house."
12. 2. 26. = 729. Organ Mountains.

A date given as 12. 26 (omitting the month) in Westwood's list has probably been accidentally substituted for that of 729.

25. 8. 27. = 730. Ollaria to Rio Pardo.

26. 8. 27. = 731. R. Pardo to Cubatão. (See 515.)
"Lepidoptera caught on the riverside at the ferry of the

Rio Pardo" (A.M.) or "at the passage of the several streams this day" (P.M.).

Bz. 27. 8. 28. = 732. Goiaveira. Between Goyaz and Jeraguá. "All these Lepidoptera were caught at the ford of the rivulet at Goiabeira, at 5 P.M." This rivulet is evidently one of the head waters of the Rio Tocantins.

Westwood's list gives eight more additional specimens captured on this date. His list also refers to the following additional specimens, the dates of which have made it possible to recover the accompanying data:—

- 564. I. [19. 10. 25.] Minas Geraës. "*Papilio*."
- 4. 11. 25. 2 specimens. Minas Geraës. (As 559.)
- 10. 11. 25. Minas Geraës.
- 31. 1. 26. Rio de Janeiro. (As 474.)
- 9. 2. 26. Organ Mountains. (By the river Pacaqué.)
- 9. 3. 26. Rio de Janeiro.
- 12. 3. 26. " " "Aqueduct."
- a. 24. 8. 27. 2 specimens. Ollarfa, just S. of the Rio Pardo.
- 25. 8. 27. 5 specimens in addition to 730.
- a. 26. 8. 27. 3 specimens. R. Pardo to Cubatão. (See 515.)
"Lepidoptera caught on the river side at the ferry of the Rio Pardo."
- 27. 8. 27. R. Pardo to Retiro.
- 11. 10. 27. 2 specimens. "To Fórna" (from the south). Between Meia Ponte and Bomfim.

Westwood noted these as belonging to the genus *Catagramma*, and on 727 he had written "*Hydaspes*. Drury iii, pl. 15 *Lyrophila* Hb. Zutr. 397." Burchell's specimens of *lyrophila* correspond well with a long series in the Godman-Salvin Collection from Rio de Janeiro, Minas Geraës, Chapada, and Paraguay.

Catagramma latona, Butl.

10. 4. 28. ♀ = 733. Goyaz. Caminho de Carréira. "All caught in the Caminho da Carreira, beyond the Church of Sta. Barbara. The whole road being woody."

Westwood's list places this in the series of *Catagramma sorana*, Godt.

This specimen exactly resembles Butler's type in the Godman-Salvin Collection, but three specimens in the British Museum labelled "*C. latona*, Butl.," differ in having a narrower red subapical band.

Catagramma sorana, Godt.

a. 26. 8. 27. = 734. R. Pardo to Cubatão. (See 515.)
"Lepidoptera caught on the river side at the ferry of
the Rio Pardo."

Bz. + p. 26. 8. 27. = 735. R. Pardo to Cubatão. (See
515.) "Lepidoptera caught at the passage of the
several streams this day."

Bz. + 30. 8. 27. = 736. "On the road between Paciencia
and Veravinha." (As 552.)

30. 8. 27. = 737. "On the road between Paciencia and
Veravinha."

Bz. a. 24. 8. 28. = 738. Retiro. (As 610.)

Westwood's generic name agrees: his list also corresponds,
except for the inclusion of 733 and the accidental substitution
of two "a. 26. 8. 27" for one of this date and one of
"p. 26. 8. 27."

Catagramma selima, Guénée.

Bz. + a. 26. 8. 27. ♂ = 739. R. Pardo to Cubatão. (As
734.)

9. 9. 27. ♂ = 740. Tenéte. Close to Rio Grande.

Bz. + 24. 10. 27. ♂ = 741. Meiaponte to S. Joaquim
(Joaq. Alves).

Westwood's list adds another specimen captured on this
date.

a. 24. 8. 28. 3♂ = 742-744. Retiro. (As 610.)

27. 8. 28. ♂ = 745. Goiaveira. (As 732.)

Westwood's list adds five individuals, captured a. 24. 8. 27
at Ollaria, just S. of R. Pardo, and omits the three captured
a. 24. 8. 28. The discrepancy may, perhaps, be accounted
for by the clerical substitution of "27" for "28" in the year
of the date, in which case two specimens are still missing.
His generic name agrees, and on 739 he had written "*Cyno-*
sura ♀ Hew. Ex. Lep. f. 22, 28."

This species was compared with type in the British
Museum. In the Hewitson Collection it stood under *C. cyno-*
sura, Doubl. Hew. A series named *C. astarte*, Cr., in the
Godman-Salvin Collection is also very similar, except that
the markings on the undersides are rather heavier than in
Burchell's specimens.

Catagramma cyllene, Dbl. & Hew.

Bz. 359. I. [15. 10. 25]. = 746. Minas Geraës. "Papilio.

At the Discobérto do Antonio Velho. Aff. 285." By this number Burchell refers to *Callicore olymnea*, Cr. Bz. + 966. I. 26. 10. 25. = 747. Minas Geraës. "Pap [ilio]. At Discoberto; near João Pedro's house."

Westwood's list and generic name agree, except for an obvious clerical error in the number of the last specimen, which is given as 996. On 747 he had written "*C. Cyllene* Gen. D. L. Pl. 28 *Pygas* ♀ teste Hew. Cat. Iconogr."

Catagramma pygas, Godt., f. *thamyras*, Mén.

28. 4. 28. = 748. Goyaz. "Papiliones caught by C[ongo] at the Carioca spring." Congo was Burchell's native servant.

Westwood's list and generic name agree.

In the British Museum this is given as the *thamyras*, Mén., form of *C. pygas*, Godt. Four similar specimens from Chapada are unnamed in the Godman-Salvin Collection.

Catagramma pyracmon, Godt.

a. 26. 8. 27. 2 = 749, 750. R. Pardo to Cubatão. (As 734.)

Westwood's list adds two more captured on this date, one in the morning and the other in the afternoon.

Bz. 27. 8. 27. = 751. Rio Pardo to Retiro.

27. 8. 27. = 752.

Westwood's list adds an "individual captured 25. 8. 27, Ollaria to Rio Pardo, and another with a. 29. 8. 27, Cervo. (As 527.) He writes against this also the genus *Catagramma*.

Catagramma sp. near *peristera*, Hew.

3. 3. 28. = 753. Goyaz. "Caught in the town by the rio Vermelho; by C[ongo]."

Westwood's date and generic name agree.

This specimen bears a Westwood's label which is somewhat difficult to interpret, but almost certainly reads thus:—"Obs. [serve] plaga sang. alar. post.; [or ? "i" for "in"] forma diversa alar. post. An. sign. alb. necnon striola cærul. marg. al. post." It is obvious that "ant." should have been written in place of one "post.," probably the first. The "An" is probably intended for "Ant." Before "An" is a mark which may be Westwood's monogram or, perhaps, an erased letter.

This is probably a geographical subspecies of *C. peristera*, and compared with a long series from Bolivia, the Lower Amazon, New Granada, Ecuador, and Eastern Peru in the

Godman-Salvin Collection, exhibits the following differences:—(i.) the red patch in hind wing is narrower than in the above-mentioned species; (ii.) the blue on the margin at anal angle is slightly more developed; (iii.) the hind-wing underside in Burchell's specimens has the yellow submarginal line of the same width from costa to anal angle, while in the Godman-Salvin series this yellow line is widest at its costal end, and tapers off to the second median nervule, where it is interrupted by a black spot, and again by a second spot at the first median nervule.

Catagramma pasithea, Hew.

24. 3. 29. = 754. Porto Real (Nacional). Mângas.
 (5.?) 5. 29. = 755. Red Clay-slate cliffs [at Sucuri] on
 the Rio Tocantins, north of Porto Real (Nacional).

Westwood's dates and generic name agree.

In a series in the Godman-Salvin Collection from Peru, the Upper Amazon, and Bolivia there is a thin blue submarginal line in the hind wing which is absent in Burchell's specimens, while there is also more red developed on the underside than in his specimens.

Callicore kolyma, Hew.

Bz. 28. 4. 28. = 756. Goyaz. (As 748.)

Westwood's list gives two more individuals captured on this date.

27. 8. 28. = 757. Goiaveira. (As 732.)

Westwood's list makes this last date 27. 8. 27 instead of 27. 8. 28. He also places this and the following species of the genus *Callicore* among the *Catagrammas*.

On the underside the red marking at the base of both wings is much reduced in these two specimens, which correspond with a series of ten, half from Chapada and half from New Granada, in the Godman-Salvin Collection. But in ten from Ecuador and two from Peru and the Upper Amazon the red is more dominant. In the Hope Collection four specimens from Ecuador have the light blue submarginal line developed all along the hind margin; in one from the Upper Amazon it is only present for half the distance from the costa to the anal angle, while in these two Burchell specimens it is still further reduced to a small streak across the apex. On the underside this peculiarity is even more noticeable, the line being reduced to two small blue dots in 756 and absent altogether in 757. Furthermore, in a series of five from S.E. Brazil in the Godman-Salvin Collection this line is only partially developed. On the upperside in three of these there

is a well-marked red spot on the fore wing just beyond the apex of the discoidal cell, which is much less developed in Burchell's specimens and in the remaining two of the Godman-Salvin series of five.

Omitting the consideration of this last variable character in S.E. Brazil, it appears that the development of the red patch at the base and the blue line at the hind margin are the chief characteristics of the western forms, and that both become more reduced as we follow the species south-eastwards, until, in extreme varieties, the blue line may be lost altogether (as in 757). Furthermore, the five specimens from New Granada indicate that a reduction of red similar to that of the east also occurs to the north.

Callicore candrena, Godt.

27. 8. 27. 2 = 758, 759. Rio Pardo to Retfro.

Bz. + 28. 8. 27. = 760. "Retiro." This locality on the specimen is confirmed by the Brazilian Note-book and the 'Catalogus Geographicus.'

Bz. 30. 8. 27. = 761. (As 552.) "On the road between Paciencia and Veravinha."

Bz. 27. 8. 28. = 762. Goiaveira. (As 732.)

27. 8. 28. = 763.

Westwood's list agrees, but includes an additional specimen captured on this last date, and another with the date 11. 2. 26. Organ Mountains (in a walk to the Ipé trees). On 758 he had written "Catagr. *Candrena* Hb., Zutr. 893, 894."

Callicore janeira, Feld.

Bz. + 12 a. 4. 5. 29. = 764. Funil; north of Porto Real (Nacional).

This specimen does not bear any of the numbers of Westwood's list of Nymphalinae, but it is probably referred to under *Callicore eluina*, Hew.

Callicore clymena, Cram.

Bz. 285. III. [13. 10. 25]. = 765. Minas Geraes. Para-hiba. "Papilio . . . (253)." This latter number refers to a missing specimen which Burchell considered identical with 285. Opposite (253) he had written "Papilio '88.' In open sunny places; very common about Ranchos and in yards near houses. It is often very familiar." [Butterflies of this genus (*Catagramma*) are called 88's because of the markings on the undersides of the hind wings.]

Westwood's list gives either one or two more of this date. The figure is indistinct.

4. 11. 25. = 766. Minas Geraës. (As 559.)

Westwood's list mentions three more captured on this date.

2. 3. 29. = 767. Porto Real (Nacional).

In the Godman-Salvin Collection the name *janeira* is given to the northern and eastern form; *clymena* (on the whole rather more heavily marked on the underside and a deeper blue on the hind-wing upper surface) to the south-west; while four specimens from Rio Grande and Sta. Catherina (still further south), in which the blue at the apex of the fore wing is greatly reduced, are unnamed. Specimens of both *clymena* and *eluina* are grouped under N. 46 and also under N. 72 of Westwood's list. He gives the generic name *Catagramma* to both numbers.

Callicore eluina, Hew.

Bz. + 1. 8. 27. = 768. The Brazilian label has the words "on the road," and upon the English label is "iter faciendo." Between Jundiahá and Cupivarý. North of S. Paulo. The 'Catalogus Geographicus' gives the date "a. 1. 8. 27" opposite the words "on road." This date is not mentioned by Westwood.

25. 8. 27. 32 = 769-800. Ollaria to Rio Pardo.

Bz. + 25. 8. 27. 7 = 801-807. "

Westwood's list gives nine more individuals captured on this date.

a. 26. 8. 27. 6 = 808-813. Rio Pardo to Cubatáo. (As 734.)

Bz. + a. 26. 8. 27. = 814. "

Westwood's list gives four more specimens of this date.

a. 28. 8. 27. = 815. At Retiro. Just north of Rio Pardo.

This date, including the "a," is not mentioned by Westwood, but possibly one of his four additional specimens of the preceding date may have been accidentally copied as the 26th instead of the 28th.

28. 8. 27. 2 = 816, 817. "Retiro." As above.

a. 29. 8. 27. 8 = 818-825. Cérvo. (As 527.)

Bz. a. 29. 8. 27. 3 = 826-828. "

Westwood's list gives six more specimens captured on this date.

a. 24. 8. 28. = 829. Retiro. Between Goyaz and Jeraguá. "All at the rivulet near the house at Retiro."

Bz. a. 24. 8. 28. = 830. Retiro. Between Goyaz and Jeraguá. "All at the rivulet near the house at Retiro."

The dates of both 829 and 830 are omitted by Westwood.

Bz. 27. 8. 28 + 25. 8. 27. = 831. Goiaveira (as 732), or Ollaria to Rio Pardo.

This specimen evidently bears the labels of two specimens captured at dates a year apart. The Brazilian label bears the later date.

27. 8. 28. = 832. Goiaveira. (As 732.)

Westwood's list gives three individuals captured 27. 8. 27. As his list does not give any specimens dated 27. 8. 28 or a. 24. 8. 28, it is possible that his 27. 8. 27 is a copyist's error for these omitted dates. One missing specimen of 25. 8. 27 may be represented by no. 831.

Westwood's list also gives the following additional specimens which are now unfortunately missing :—

354. I. [15. 10. 25]. "P[apilio]. Minas Geraës. At the Discoberto do Antonio Velho."

12. 3. 26. Rio de Janeiro. "Aqueduct."

13. 3. 26. "

19. 3. 26. " In the valley of Catombi."

3. 4. 26. " Along the Carioca Aqueduct."

a. 29. 8. 27. Cervo. (As 527.)

30. 10. 27. 2 specimens. Sapezal to Conceição; near Goyaz.

28. 1. 28. Goyaz. Caminho de Ferreiro.

28. 4. 28. 10 specimens. Goyaz. "Papiliones caught by C[ongo] at the Carioca spring."

2. 2. 29. 2 specimens. Porto Real (Nacional), Western side of River. "On the western side of the Tucantins."

10. 3. 29. Porto Real. "Lepidoptera began to appear more numerous in the end of Feby, and since the beginning of this month they appear abundant."

24. 3. 29. Porto Real. Mângá.

12. a. 4. 5. 29. This specimen is almost certainly 764.

The Godman-Salvin Collection contains only three specimens of this species. On 772 Westwood had written "Cat. Eluina Hew. Ex. B. f. 30."

Hæmatera pyramus, F.

25. 8. 27. = 833. Ollaria to Rio Pardo.

Westwood's name and date agree; the remaining two specimens come under the last number in his list of Nymphalines, and are not named by him.

27. 8. 27. = 834. Rio Pardo to Retiro.

p. 8. 9. 27. = 835. Cachoeira to Rio Grande. "At the Rio Grande. Papiliones."

Westwood's dates agree.

XVIII.—A Case of Abnormal Dentition in a Dhole, or Indian Red Dog (*Cuon dukhunensis*). By R. I. POCOCK, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

WHEN discussing variation in the premolars of the Canidae, Mr. Bateson * commented on the rarity of the occurrence of a fifth premolar in the *lower* jaw, only three or four cases being known to him. Two of these were quoted by Hensel †, the skulls presenting the abnormality being those of wolves showing two teeth between the canine and the second premolar, one in the right mandible and the other in the left. The other cases were those of domestic dogs, one presenting five premolars on both sides of the lower jaw, the other showing two alveoli where the first premolar should have been.

Since the number of recorded instances is so small, it is of interest, I think, to report the presence of a supernumerary premolar in the right mandible of a specimen of an Indian dhole (*Cuon dukhunensis*) that formerly lived in the Zoological Gardens.

The dentition of the left mandible is normal and resembles that of the mandibles of two other specimens imported at the same time, except that the posterior cusp on pm^1 is practically absent and the roots of pm^2 are united. In the right mandible also the cusp is absent and the roots of pm^2 are united. On both sides pm^1 is single-rooted; pm^2 , as stated, has two large coalesced roots set in a correspondingly large constricted alveolus; pm^3 has two large somewhat \wedge -shaped roots. There is no difficulty in homologizing these three teeth on the two sides, their size and the shapes of the crowns and roots making their identity unmistakable. The supernumerary tooth lies between pm^2 and pm^3 and is not structurally quite identical with either. Its crown is shorter than that of pm^2 , and it has its posterior portion more widely rounded than is that of pm^3 or of pm^1 . Like pm^3 it has two distinct roots, but these are gradually attenuated and separated by a much narrower cleft.

On the left mandible with normal dentition the longitudinal axes of the crowns of pm^2 and pm^3 lie in the same line as the axis of the jawbone; and these teeth are separated from the adjacent teeth, pm^1 and pm^4 , and from each other by

* 'Materials for the Study of Variation,' p. 211 (1894).

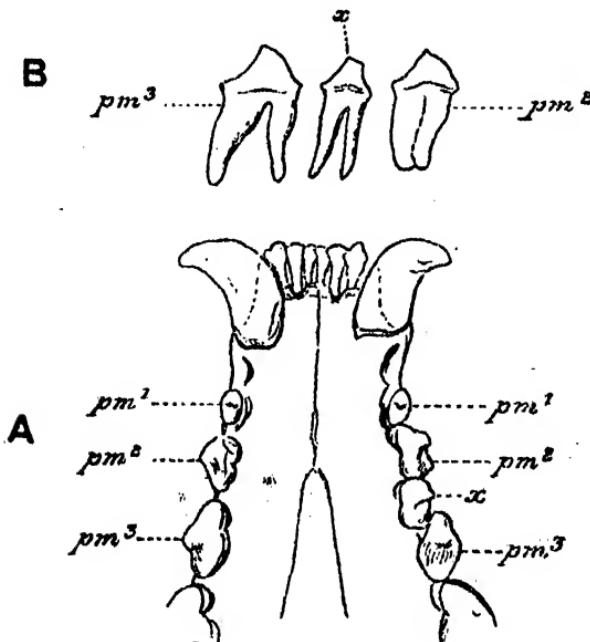
† 'Morph. Jahrb. v. n. 548 (1879): also Bateson, n. 213, no. 231.'

distinct diastemata. This arrangement is disturbed on the right side by the presence of the supernumerary tooth. The axis of pm^3 is inclined slightly forwards and inwards, that of pm^4 slightly forwards and outwards, so that the two axes continued would cut one another at an obtuse angle of about 135° . The two teeth are separated by a comparatively wide diastema, in which towards the inner side is wedged the supernumerary tooth, the axis of which is longitudinal, not oblique; its crown slightly overlaps in front the posterior portion of the crown of pm^3 and behind the anterior portion of the crown of pm^4 , and touches them both. The area between pm^1 and pm^4 on the left side is practically the same length as that on the right side, namely 20 mm.; but the sum of the two teeth, pm^3 and pm^4 , on the left side is 17 mm., while that of the corresponding teeth + the additional tooth on the right side is about 19 mm. The three teeth therefore are spread over a rather larger area than the two premolars of the left side, and this is gained by encroachment upon the diastemata separating pm^1 and pm^2 and pm^3 and pm^4 . There is no noticeable disparity in size between the normal premolars of the right and left mandibles.

Apart from the interest of the occurrence of this abnormality in the lower jaw, I am unable to find a parallel to it in the many instances of abnormality in the premolar dentition of the upper jaw in the Canidae cited by Mr. Bateson. In most cases, both in wild species and in domestic dogs, where additional premolars are recorded there are two premolars resembling the normal pm^1 between the canine and pm^2 . Perhaps the nearest approach to the above-described variation in *Cuon dukhunensis* is presented by the skull of a specimen of the black-backed jackal (*Canis mesomelas*) (no. 228 of Bateson), which showed on the right side a supernumerary tooth inside the upper pm^3 , and closely resembling it, though a little smaller. But, as has been stated, the supernumerary tooth in this skull of *Cuon dukhunensis* differs both from pm^2 and pm^3 in the shape and size of the crown and also of its roots.

In this connection arises another interesting point. In the skull of *Cuon dukhunensis* under discussion the roots of pm^3 of the lower jaw are fused—or, to put it another way, not divercated, either on the right or the left side. But this feature is, I think, abnormal in the genus, for I find that in two other skulls of this species as well as in one of a Siberian dhole (*Cuon alpinus*) the two roots of this tooth are quite distinct from base to point and resemble not a little in shape and direction the roots of pm^3 of all the dholes' skulls

examined (see the annexed figure). Hence it will be understood that the supernumerary lower premolar I have described, although unlike pm^2 of the skull to which it belongs in having its roots separated, resembles in this particular, at all events, the lower pm^2 of two skulls belonging to the same species and of one belonging to an allied species of the genus. The tooth



Abnormal Dentition in a Dhole (*Cyon dukhunensis*).

- A. Anterior portion of lower jaw seen from above. pm^1 , pm^2 , pm^3 , first, second, and third premolars of right and left sides; x , supernumerary premolar of right side.
- B. Second and third and supernumerary premolars of right side extracted.

may therefore be a slightly developed and slightly modified repetition of pm^2 , retaining in the matter of its separated roots the condition normal for the genus, which the genuine second lower premolars of this particular skull have lost. At all events, it does not appear to me to be justifiable to assume that the tooth is not an additional pm^2 on the grounds of the distinctness of its roots, although this conclusion would have commended itself had the one skull alone been available for examination.

XIX.—*Notes on the Coleopterous Genera Horia, Fab., and Cissites, Latr., and a List of the described Species.* By C. J. GAHAN, M.A.

THE two genera of Meloidæ that form the subject of these notes comprise altogether less than twenty known species, and the genera themselves are very easily to be distinguished from one another; yet the number of errors that have in one way or another come to be associated with them is truly astonishing. The chief of these errors have already been discovered and corrected by others, but, unfortunately, attention was called to them in such a way that they have been noticed either very inadequately or not at all in the 'Zoological Record'—an omission for which the Recorders are in no wise to blame. They have been brought to my own knowledge in an endeavour to determine the correct name to be given to a species in a collection from Ruwenzori Mountain on which I am now working, and will incidentally, perhaps, illustrate the difficulties with which a systematist has to contend if he wish to be accurate.

The species to which I have just referred obviously belonged to the genus generally recognized as *Cissites*, Latr.; but on reference to Kolbe's very valuable paper of 1897 on the Coleoptera of East Africa, I there found (1) that *Cissites*, Latr., was placed as a synonym of *Horia*, Fab., on the ground that the same species, viz. *Horia testacea*, Fab., was the type of both genera, and (2) that a new generic name (*Synhoria*) was proposed by Kolbe for the species (*cephalotes*, *maxillosa*, *maculata*, &c.) that had hitherto been regarded as constituting the genus *Horia*, Fab. This led me to further inquiry. I found Kolbe quite right in stating that *Horia testacea* was the type of the genus *Horia*, Fab.; but this also I found, that, contrary to the statement of Kolbe, which was probably borrowed from Lacordaire, and contrary also to a similar statement made and repeated by Latreille himself, *Horia testacea*, Fab., is not the type of *Cissites*, Latr. The type of this genus I found to be *Cissites maculata* (Swed.), the *Horia maculata* of Olivier and Fabricius, one of the species included by Kolbe in his genus *Synhoria*. It does not necessarily follow, however, that *Synhoria* should be treated as a synonym of *Cissites*. Kolbe specified no type for his genus; and if *cephalotes*, Oliv., the first species mentioned by him, be taken as the type, it will be shown that *Synhoria*, if not a distinct genus, is at least a very

distinct subgenus of *Cissites*, distinct both structurally and geographically.

So far the result of my investigation was to show that for over half a century the genera *Horia* and *Cissites* had been interchanged in our collections and entomological works. But a stranger discovery was to follow. I found that this remarkable error had already been discovered and published by Professor Beauregard in his admirable treatise on 'Les Insectes Vésicants,' dated 1890. In dealing with the matter the learned Professor himself fell into some trifling errors (one of a somewhat amusing character), and made also one very lamentable mistake—that of adopting knowingly in his own work the very errors to which he had called attention. From Latreille's Hist. Nat. 1804 he quotes the following passages to show what Latreille's original conceptions of the genera were:—"L'*Horia testacea* diffère des autres espèces par les proportions de la tête et du corselet qui sont plus étroits que les élytres, ce caractère m'a engagé à former parmi les Hories un nouveau genre celui des *Cissites*. Cette nouvelle coupe serait composée de l'*Horia maculata* d'Olivier et de son *Horia cephalotes*. L'*Horia testacea* serait le type du genre *Horia* On voit ainsi que les Hories à tête de la largeur du corselet ou plus large, mes *Cissites*. . . ."

"Il ressort de ces phrases que Latreille donnait le nom d'*Horia* aux espèces à tête plus large ou égale en largeur au corselet et celui de *Cissites* aux espèces à tête et corslet moins large que les élytres."

This exposition by M. Beauregard of Latreille's phrases is, of course, an absolute inversion of the facts, exactly what, a few lines further on, he charges Lacordaire with having made. "Lacordaire," he writes, "réprit pour son compte cette division en deux genres, mais par une singulière erreur, il intervertit les caractères et assigna le nom de *Horia* aux espèces à tête grande aussi large au moins que le prothorax et celui de *Cissites* aux espèces à tête médiocre plus étroite que le prothorax."

The charge made against Lacordaire is just, but there is this excuse for him: the same mistake was previously made by Castelnau, and, as I find, originated with Latreille himself, who in 1807, three years after the first publication of his genus, assigned the characters and species of his own genus *Cissites* to *Horia*, Fab., and *vice versa*. This mistake he repeated in 1829; but in a work which came between—the article "Horia" in the "nouvelle édit." of the "Nouveau Dictionnaire," which is signed *O.* and *L.*—the genera are constituted as they originally were in the first edition, and

further, *Horia maculata* is definitely stated there to be the type of the genus *Cissites*.

It is interesting to note that although Lacordaire, in his 'Genera,' and Gemminger and Harold, in their 'Catalogue,' wrongly construe the genera, the single reference in each case is to one of those works of Latreille in which the genera are correctly characterized.

But it is not alone in reference to the interpretation of the genera that mistakes have occurred. There is scarcely a single one of the older species, and not many, I fear, amongst those more recently described, with which some mistake is not associated.

To begin with : the *Horia testacea*, Fab., type of the genus *Horia*, is not the species Fabricius thought it was, viz. the *Lymexylon testaceum*, Fab., of an earlier work, and will therefore require a new name if one cannot be found for it amongst those since published, which is not improbable. It may possibly be the species described by Fairmaire as *Cissites debyi*; it was clearly, I think, the latter species that Aurivillius took to be *testacea*, Fab., and which he differentiated as such when describing his own species *africanus*. There is, however, another species equally as common as *debyi*, if not more common, in South India, and to this other species, regarded by some authors as the true *Horia testacea* of Fabricius, the characters given for *africanus* apply. In the uncertainty therefore as to what species the type of the genus *Horia* really is, we must continue to call that type *Horia testacea*, Fab. Fabricius specified no collection as containing his type specimens. *Cucujus clavipes*, Fab., given as a synonym by Fabricius, has nothing to do with it.

The type specimen (a female) of *Lymexylon testaceum*, Fab. (1781), is preserved in the Banksian cabinet of the British Museum. It belongs to the genus *Cissites*, Latr., and is without doubt an African species.

Horia cephalotes, Oliv., stated by its author to have come from S. America, and later placed by Fabricius as a synonym of his *maxillosa* from the E. Indies, has since been shown by Gerstaecker to be an African species quite distinct from *maxillosa*. Described from a male, it is probably identical with *Cissites testacea*, Fab.

Horia senegalensis, Casteln.—With regard to this species, I have come independently to the same conclusion as De Borro (1883), that it was made up of two distinct species, that the so-described male was in reality the female of a species belonging to the true *Cissites*, Latr., and that the female belonged to a species of *Horia* scarcely, if at all, distinguish-

able from the Indian species known as *testacea*, Fab.,—that it was, if I may so put it, *testacea*, Fab. (*Lymexylon*), on the male side and *testacea*, Fab. (*Horia*), on the female side.

Cissites macrognatha, Fairm. (*Horia*), from West Africa, is probably also identical with *testacea*, Fab. It was described from a male, but the author evidently assumed that the so-called male of *senegalensis*, Casteln., with the characters of which he compared it, was actually a male.

Four other African species referable to the genus *Cissites* have been described, and it is possible that one or more of these will turn out to be the same as *testacea*, Fab. In the British Museum collection there are specimens from Cape Colony that I cannot distinguish specifically from *testacea*. They do not, however, agree exactly with the description of *hottentota* given by Peringuey. I suspect, nevertheless, that Peringuey's species is the same.

As I have seen no specimens of *Cissites* from East Africa, I can express no opinion as to the validity of Kolbe's species *fischeri*. Gerstaecker considered a female specimen from East Africa to belong to the species *cephalotes*, Oliv.

Only two species of *Cissites* from the Oriental Region have been described—one the *maxillosa* of Fab., the other *anguliceps*, Fairm.; and I strongly suspect that the second was founded upon the female of the first.

The African and Oriental species of *Cissites* possess in common two characters of considerable importance which distinguish them from the American species, and I propose therefore to place them in a distinct subgenus, to which the name *Synhoria*, Kolbe, may be applied. The distinguishing characters are as follows:—

Eyes smooth and very glossy. The episterna of the mesothorax do not meet in front of the mesosternum or meet only at a point.....
Eyes coarsely granulated and dull. The episterna of the mesothorax meet in the middle line and form a suture of some length in front of the mesosternum

*Cissites.**Synhoria.*

Genus HORIA.

Horia, Fab. Mant. Ins. i. p. 164 (1787); Latr. Nouv. Dict. d'Hist. Nat. xxiv. p. 154 (1804); id. Hist. Nat. Crust. et Ins. x. p. 364 (1804); Oliv. et Latr. Nouv. Dict. d'Hist. Nat. n. édit. xv. p. 291 (1817); Kolbe, Deut. Ost-Afrika, iv. Coleopt. p. 256 (1897); Champion, Suppl. List Cantharidae, Ann. Soc. Ent. Belg. 1899, p. 156.

Cissites, Latr. Gen. Crust. et Ins. ii. p. 213 (1807); id. Cuvier, Règne Anim. n. édit. v. p. 60 (1829); Casteln. Hist. Nat. ii. p. 280 (1840); Lacord. Gen. Coleopt. v. p. 663 (1869); Gemm. et Har. Cat. p. 2130 (1870); Beauregard, Les Insectes Vésicants, pp. 416 & 436 (1890).

Type of the genus, *Horia testacea*, Fab., 1787 (nec *Lymexylon testaceum*, Fab., 1781).

1. *H. africana*, Auriv. (*Cissites*) Ent. Tidskr. xi. p. 203 (1890). Congo.

? = *senegalensis*, ♀ (nec ♂), Casteln. Hist. Nat. ii. p. 280 (1840).

? = *testacea* (Fab.), De Borre, Ann. Soc. Ent. Belg. 1883, C. R. pp. 136-138.

2. *H. debyi*, Fairm. (*Cissites*) Ann. Soc. Ent. Belg. xxix. C. R. p. 111 (1885). "Sumatra," Java, Borneo, India, Ceylon, and Philippine Islands.

= *testacea* (Fab.), Auriv. l. c. supra.

3. *H. testacea*, Fab. Mant. Ins. i. p. 164 (1787). "Tranquebar."

Genus *CISSITES*.

Cissites, Latr. Nouv. Dict. d'Hist. Nat. xxiv. p. 154 (1804); id. Hist. Nat. Crust. et Ins. x. p. 364 (1804); id. Nouv. Dict. d'Hist. Nat. nouvelle éd. xv. p. 291 (1817).

Horia, Latr. Gen. Crust. et Ins. ii. p. 211 (1807); id. Cuvier, Règne Anim. nouv. éd. v. p. 80 (1829); Casteln. Hist. Nat. ii. p. 280 (1840); Lacord. Gen. Coleopt. v. p. 663 (1859); Gemm. & Har. Cat. p. 2190 (1870); Beauregard, Les Insectes Vésicants, pp. 414 & 485 (1890).

Synhoria, Kolbe, Deutsch Ost-Afrika, iv. Coleopt. p. 250 (1897); Champion, Supplemental List Cantharidæ, Ann. Soc. Ent. Belg. 1899, p. 156.

Type of the genus, *C. maculata*, Swedens (*Cucujus*).

American Species (subgen. *Cissites* proper).

1. *C. apicalis*, Perty (*Horia*), Del. Anim. p. 66, pl. xiii. fig. 14 (1830). Brazil.

2. *C. auriculata*, Champ. (*Horia*) Biol. Centr.-Amer., Col. iv. 2, p. 372, pl. xvii. fig. 9. Central and North America.

3. *C. maculata*, Swed. (*Cucujus*) Vetensk. Ac. Nya Handl. 1787, p. 199, pl. viii. fig. 8; Fabr. (*Horia*) Ent. Syst. i. 2, p. 90 (1792); Oliv. (*Horia*) Entom. iii. no. 53 bis, p. 4, pl. i. fig. 1 (1795). Central and South America and Antilles.

? Var. *apicalis*, Perty, l. c. supra.

African and Oriental Species (subgen. *Synhoria*).

African Species.

4. *C. cephalogona*, Fairm. (*Horia*) Notes Leyd. Mus. x. p. 269 (1888). Congo.
5. *C. cephalotes*, Oliv. (*Horia*) Ent. iii. no. 53 bis, p. 5, pl. i. fig. 3 (1795); Geist. (*Horia*), Decken's Reisen in Ost-Afrika, iv. 2, p. 205 (1873). Africa.
6. *C. crouzeti*, Fairm. (*Horia*) Ann. Soc. Ent. Belg. 1894, p. 829. Abyssinia.
7. *C. fischeri*, Kolbe (*Synhoria*), Deut. Ost-Afrika, iv. Col. p. 256 (1897). Victoria Nyanza.
8. *C. hottentota*, Pering. (*Horia*) Trans. S. Afric. Phil. Soc. iv. p. 134. South Africa.
9. *C. macrognatha*, Fairm. (*Horia*) Notes Leyd. Mus. ix. p. 193 (1887). West Africa.
10. *C. senegalensis*, ♂ (nec ♀), Casteln. (*Horia*) Hist. Nat. ii. p. 280 (1840). West Africa.
11. *C. testacea*, Fab. (*Lymexylon*) Sp. Ins. i. p. 256 (1781). Africa.

? = *cephalotes*, Oliv. l. c. *supra*.? = *senegalensis*, ♂, Casteln. l. c. *supra*.? = *macrognatha*, Fairm. l. c. *supra*.? = *hottentota*, Pering. l. c. *supra*.

Oriental Species.

12. *C. anguliceps*, Fairm. (*Horia*) Ann. Soc. Ent. Belg. xxix. C. R. p. 111 (1885). Sumatra or Borneo.
13. *C. maxillosa*, Fab. (*Horia*) Syst. Eleuth. ii. p. 86 (1801). "Sumatra," Java, Borneo, Malay Penin., Burma, Siam, and Philippine Islands.

? = *anguliceps*, Fairm. l. c. *supra*.

XX.—Contributions towards a Revision of the Genus
Lomanotus. By NATHANIEL COLGAN, M.R.I.A.

WHILE dredging off Bullock Harbour, Dublin Bay, on the 6th October, 1906, what seemed to be a fairly successful haul was made in 10 fathoms low water. As there was a heavy rolling sea on, and our small boat was much too lively to permit of any careful sorting of the contents of the dredge, the whole haul was emptied into a bucket of sea-water. On landing soon after I observed floating near the surface of the water in the bucket a prettily frilled, rosy orange-coloured animal quite unfamiliar to me, yet obviously a nudibranch. It was transferred to fresh sea-water in a glass jar, when it immediately began to swim vigorously to and fro and up and down, with a rapid, lashing, serpentine motion of its flexible body, the thin foot-margins being drawn inwards and downwards so as to form a sharp keel favourable to quick and graceful navigation. For a nudibranch it had a singularly dashing manner. It darted rather than swam, as if it gave way to fits of petulance whenever it found its motion impeded by the translucent yet impenetrable walls of its prison. The animal lived in captivity for a day and a half, so that I had ample opportunity of observing it and drawing up the following tolerably minute description:—

Length of living animal fully extended $1\frac{1}{4}$ inch. General colour of upper surface translucent rosy orange, of the sides paler, passing into whitish on the under surface, no distinct colour spots or blotches being apparent anywhere. Body elliptic-oblong, deep (not flat), gradually narrowed behind into a very short and ill-defined tail. Foot with two slender tentacular processes on each side in front, the anterior pair usually carried in a recurved or hooked posture. Dorsal tentacles or rhinophores two, bright yellow, club-shaped, obliquely laminated, suddenly narrowed above into short, blunt, cylindric-conic, smooth, white tips and rapidly retractile within long sheaths. Margin of the right-hand sheath (as one looks towards the head of the animal) divided into 4 (or 5?) irregular teeth or lobes, that of the shorter, left-hand sheath, simple or at most sinuate. Along each side of the back runs an erect, flexible, frilled process, the pleuropodium or pallial margin (*Rückengebräme* of Bergh), waved into three deep bays whose convexity points inwards towards the median line of the animal. The upper margin of this frill is cut into not very numerous tooth-like, flattish, triangular segments (branchial papillæ?) of unequal size, the longest occupying

the centre of each bay. The pleuropodium declines suddenly as it approaches the anterior extremity of the animal, yet persists as a distinct ridge until it reaches to and effects a junction with the base of the rhinophore-sheath; towards the posterior extremity it declines gradually, and becomes obsolete as it approaches the tail. The rosy orange of the body takes a deeper tone in the pleuropodium, yet the tips of the segments or papillæ are not distinguished by any marked difference of colour. The deep red viscera of the animal sending off branches (hepatic lobes) on either side to the pleuropodium are clearly visible through the pellucid tissues of the back. The mandibles when treated with caustic potash showed under a $\frac{1}{4}$ -inch objective a finely cross-hatched or tessellated masticatory margin (*Kaurand* of Bergh). Under the same power the general character of the radula with its finely serrated teeth-margins was easily made out: unfortunately before the examination of this exquisitely constructed organ was completed it was lost by an explosive ebullition of the potash in which it was being boiled over a lamp-flame.

On comparing this description and the dead animal with Alder and Hancock's Monograph, it became clear that my capture belonged to the genus *Eumenis* instituted by these authors in 1845 and that it was structurally in close agreement with the species *E. marmoratus* as described and figured by them in that year. The genus *Eumenis* having been founded by Alder and Hancock in ignorance of the fact that an equivalent genus *Lomanotus* had been created by an Italian scientist a year earlier, they subsequently abandoned the name *Eumenis* in favour of *Lomanotus*. But close as was the resemblance of the Dublin Bay *Lomanotus* to *Lomanotus (Eumenis) marmoratus*, the differences in colour, size, and form were yet sufficient to raise doubts as to their identity. In the Monograph the rhinophore-sheaths of *L. marmoratus* are described as having simple margins, the pleuropodium is represented as disconnected from the sheaths and continued forward in advance of them, the animal is described as opaque and marbled with dark brown and white, while its length is given as little more than half an inch. It was obviously necessary to make a close study of the literature of the genus before venturing to decide whether the Bullock *Lomanotus* might safely be assigned to any of the established species or should be set down as nondescript.

The result of this study when made was to show the rarity of most of the species of *Lomanotus*, the necessarily meagre material on which some of the species had been founded, and the unsatisfactory nature of many of the specific distinctions

relied on. The following survey of the history of *Lomanotus* will serve to illustrate these points, and will also, it is hoped, furnish material for estimating the value of the revision of the genus which it is the main object of this paper to propose. In any case, this historical sketch can hardly fail to be useful to students of *Lomanotus*, as giving them a rather full résumé of the scattered and by no means easily accessible literature on the subject.

1844.—Giovanni Battista Vérany, of Genoa, describes in the August issue of the 'Revue Zoologique par la Société Cuvierienne' (tome vii. p. 303) a new genus of Nudibranch Mollusca to which he gives the name *Lomanotus*. The generic characters here published by Vérany are as follows:—

"Corps allongé, cunéiforme, gastéropode; tête aussi large que le corps, munie d'un voile frontal portant de chaque côté de petits prolongements tentaculiformes; deux tentacles dorsaux, retractiles, terminés en massue comme dans le *Doris* et logés chacun dans une espèce d'étui caliciforme; organes de la respiration formés par deux membranes minces et frangées, fixées de chaque côté entre la face dorsale de l'animal et les faces latérales; orifices de l'anus et des organes génitaux comme dans les *Tritonies*."

In the month following this first publication of *Lomanotus* Vérany introduces the new genus to the special notice of Italian zoologists in a paper on the Nudibranchs of Liguoria read by him at the Sixth Congress of Italian Scientists held at Milan. In the report of this Congress, published in Italian at Milan in 1845 ('Atti della Sesta Riunione degli Scienziati Italiani tenuta in Milano nel Settembre del 1844'), an abstract is given of Vérany's description of the new mollusc as read before the Congress. Here the original French description of the genus is improved on, notably as regards the branchial processes (the pallial curtain, epipodial ridge, or pleuro-podium, as it has been variously termed). The branchiae are here said to be in the form of a fringe irregularly festooned and toothed, attached longitudinally to the sides of the body and to the sheaths or calyces ("con le branchie a frange irregolarmente festonate e dentate attaccate longitudinalmente ai lati del corpo ed ai calici"). The abstract concludes with the statement that the species is dedicated to Prof. Gené ("La specie è dedicata al Prof. Gené"). Vérany at the meeting of the Congress in 1844 evidently described the species no less than the genus, and he clearly intended that the species should bear Gené's name. As he did not, however, assign to the species, either at the Congress or in the

published report of its proceedings, the Latin binomial *Lomanotus genei*, a strict compliance with nomenclature rules will not permit of that name dating from 1845. It was not until 1846 that he definitely named the species *L. genei*.

1845.—Joshua Alder and Albany Hancock, in ignorance of the existence of Vérany's genus *Lomanotus*, found their genus *Eumenis* on a single specimen of a nudibranch $\frac{1}{2}$ inch long dredged in deep water near Berry Head, Torbay. The generic characters of *Eumenis*, as first published in the Ann. & Mag. Nat. Hist. for November 1845 (vol. xvi. p. 311), are substantially the same as those of Vérany's *Lomanotus*. This was acknowledged by Alder and Hancock in the section of their famous 'Monograph of the British Nudibranchiate Mollusca' which appeared in 1854, where they concede precedence to Vérany's name for the new genus. A full specific description of the Berry Head nudibranch was published along with the generic characters of *Eumenis*, the species being named *E. marmorata*. This was not only the first species of the genus detected in the British Isles, but was also the first anywhere named, described, and published in strict conformity with nomenclature rules. The Monograph gives coloured plates of *E. marmorata* in which the rhinophore-sheaths are shown with entire margins, while the pleuropodium is represented as disconnected from the sheaths and passing round their bases to the front of the animal. The prevailing colour of the body is shown as brown marbled with white. The following passage in the Monograph may be taken as disclaiming perfect accuracy for either the description or the figure of the animal:—"It was a little injured and lived only a short time after being brought on shore, so that we had no opportunity of observing its habits, and the drawing and description are consequently not so perfect as we could have wished."

1846.—Vérany, in a Guide to Genoa, published in that city, gives a Catalogue of the Marine Invertebrates of the Gulf of Genoa and Nice ("Catalogo degli Animali invertebrati marini del Golfo di Genova e Nizza"). In this Catalogue (pp. 24–25) appears for the first time a full description of the species he had previously (at the Milan Congress) dedicated to Prof. Gené. At the head of the description the animal is named in Italian *Lomanoto di Gené*, but the omission to supply in the text a valid Latin binomial is made good in figure 6 of plate ii. at the end of the Catalogue, where the name *Lomanotus genei* appears beneath a tolerably good out-

line of the animal. A full rendering of the Italian description is here given:—

Body elongate wedge-shaped, the back somewhat convex. Branchiae adhering anteriorly to two annulated caliciform sheaths with a four-toothed aperture, the sheaths including the two dorsal tentacles, which are club-shaped and furnished with small, parallel, oblique laminæ. Foot narrow, with an anterior marginal groove. Aperture of the genital organs on the right side and far forward, anus on the same side and placed far backward. Colour intense wine-red, dotted with white, variable by reason of its transparency, which allows the internal parts of a darker red to show through. Length 60". Fished up rarely from a depth of 200–250 metres, in consequence of which the animal is only obtained dead [or? and?] more or less imperfect, as it is very soft ("onde non si ottiene se non morto più o meno imperfetto, perché è molto floscio").

In this same year (1846) Alder and Hancock describe, in the Ann. & Mag. Nat. Hist. for November (vol. xviii. p. 293), a second species of their genus *Eumenis* (afterwards acknowledged by them to be equivalent to *Lomanotus*) from a single specimen $\frac{1}{2}$ inch long taken in from 3 to 4 fathoms in Lamlash Bay. This species they name *E. flavidus*. The colour of the body is yellow, with brown spots, the sheath-margins are tubercled, and the pleuropodium is indistinct, its place being marked, or, rather, suggested, by a line of small papillæ along each side of the body, marked off at intervals by isolated larger papillæ. In the sixth part of the Monograph, which appeared in 1854, this species is figured and named *Lomanotus flavidus*.

1860.—William Thompson describes, in the Ann. & Mag. Nat. Hist. (ser. 3, vol. v. p. 50), a third British species of *Lomanotus*, making, with Vérany's *L. genei*, the fourth species of the genus so far detected. The description of this new species, which he names *L. portlandicus*, is founded on two specimens each $1\frac{1}{4}$ inch long dredged at Weymouth, one in 1855, the other in 1856. In colour this species differs from the three previously described, the body being pellucid white, tinged with brownish yellow on the back and pale orange-red in front; the sheath-margins are divided into six finely pointed filaments, and the pleuropodium commencing in front of the sheath-bases continues "behind the termination of the tail." In the absence of any figure it is impossible to clear up the obscurity of this description of the pleuropodium as continuing behind the termination of the tail.

publ 1877.—Rev. A. M. Norman describes, in the Ann. & Mag. Nat. Hist. (ser. 4, vol. xx. p. 518), a fourth British species, which he names *L. hancocki*. The description is drawn up from a single specimen $2\frac{1}{4}$ inches long, dredged off Berry Head, Torbay, in 1875. In colour the animal is of a light pinkish orange and very transparent, so that the internal organs show clearly through the skin ; the rhinophores are quite destitute of laminae and so short as scarcely to exceed the sheaths, which latter terminate above in a calyx-shaped expansion formed of five leaf-like points. It seems clear that this description of the rhinophores was drawn up at a time when they were fully retracted, their smooth tips alone being visible above the sheath-margins. It is admitted that the rhinophores were not dissected out in this case *.

1878 and 1883.—Dr. Rudolph Bergh, of Copenhagen, makes an important contribution to our knowledge of the genus in his well-known “Beiträge zur Kentniss der Aeolidiaden” (Verhandl. der zool.-botan. Gesellschaft in Wien, 1878, p. 553, and 1883, p. 66), in which he gives an exhaustive description with anatomical plates of *L. genet*, founded on an examination of two specimens, one $1\frac{1}{2}$ inch long dredged in the Bay of Naples and preserved in spirit, the other a living specimen $1\frac{1}{2}$ inch long dredged in the Adriatic near Trieste. In so far as they deal with obvious features, both Vérany’s (1846) and Bergh’s descriptions agree closely, the only differences being as to colour and degree of opacity dependent on colour. While the wine-red of Vérany’s animal allowed the dark red viscera to appear through the body, the purple of Bergh’s concealed them (“Die Eingeweide schimmerten nirgends hindurch”).

1883.—At the meeting of the Academy of Physical and Mathematical Sciences of Naples held on the 10th March Signore S. Trinchese reads a paper entitled “Di una nuova forma del genere *Lomanotus* e del suo sviluppo.” This paper, which does not appear to have received, at least in the British Isles, the consideration it merits, is published in the ‘Rendiconti’ of the Academy for 1883 (Anno xxii. pp. 92-94), and gives not only a full description of the new *Lomanotus* from a mature specimen, but also a most valuable account of the development to maturity of a young individual measuring scarcely $\frac{1}{2}$ inch (2 mm.). Both specimens were

* See Garstang’s “Nudibranchiate Mollusca of Plymouth Sound,” Journ. of Marine Biol. Assoc. of United Kingdom, vol. I.

taken in the Bay of Naples at a depth of 40 mètres in association with the common hydroid *Antennularia ramosa*, and the younger individual was kept alive in an aquarium and nourished on the hydroid for the space of a month. Trinchese, struck by the peculiar aspect of the adult animal $\frac{1}{2}$ inch long (he speaks of it as "singolarissimo"), gives a full description of its outer features, with some anatomical details, and proposes for the new *Lomanotus* the name *L. eisigii*. In its general features, as here described, *L. eisigii* agrees very closely with Vérany's *L. genesi*, but the peculiar caudal extension of its pleuropodium at once distinguishes it from Vérany's and from all other previously described species of the genus. The following is a close rendering of the passage in which Trinchese describes the pleuropodium of *L. eisigii* :—

On each side of the back is placed vertically a thick membrane, which, beginning at the outward side of the base of the rhinophore, ends near the apex of the tail. Here the membrane of one side uniting with that of the other forms a broad fin, which is the principal swimming-organ. The posterior margin of this fin is furnished with small triangular papillæ. ("Quivi la membrana di un lato unendosi a quella dell' altro forma una larga pinna che è l' organo principale del nuoto. Il margine posteriore di questa pinna è munita di piccole papille triangolari.")

The margins of the rhinophore-sheaths are described as having five unequal papillæ, the body is transparent white marked with irregular opaque white blotches and red dots. The tips of the papillæ on the head, on the sheath-margins, on the pleuropodium, and on the caudal fin are opaque white, the upper third of their length being orange-yellow.

In the second section of his paper, entitled "Descrizione dell' individuo in via di sviluppo," Trinchese traces the development of the young specimen which he nourished for a month on the coenosarc or living substance of *Antennularia*. The importance of the observations here recorded and the probability that Trinchese's paper may have been overlooked by students of the nudibranchs in this country will, perhaps, justify the somewhat lengthy extracts from it now given.

At first, says Trinchese, this individual had a form so different from that of the adult that I took it for a young member of the family of the Eolididæ. From the anterior margin of the head sprouted two short tentacles, and behind these rose the two rhinophores, laminated for almost their whole length and entirely destitute of sheath. On each side of the back were fixed four conical papillæ disposed in a

longitudinal series. Each papilla contained a well-developed hepatic lobe, which extended almost to the apex of the papilla. The body of the animal ended behind in a long and depressed tail similar to that of the Eolididæ. There was no trace of a caudal fin.

The first modification which appeared in the form of the animal was the lengthening of that portion of the body comprised between the first and the second of the dorsal papillæ. Next, the base of the first papilla swelled up, forming a semi-lunar curved cushion with the concavity turned towards the rhinophore. Little by little this cushion completely embraced the rhinophore and increased in height until it enveloped the lower two-thirds of that organ, and thus formed its sheath. The upper third of the first dorsal papilla, whose lower two-thirds had been transformed into the sheath, preserved its shape and its orange-yellow colour and formed the posterior papilla of the sheath-margin. Then four other papillæ sprouted out ("spuntarono") from this sheath-margin.

Meanwhile that portion of the body lying between the second and the third of the dorsal papillæ and that between the third and the fourth lengthened day by day, and at the same time the bases of these papillæ became depressed from without inwards, and from the free margin of the depressed part sprouted small papillæ. Finally, the lower two-thirds of each papilla were transformed into a triangular arched membrane with the concavity turned outwards. The upper angle of this membrane was formed of the upper one-third of the original papilla, which had retained its primitive form and its yellow colour.

The membranes formed from the inferior region of the primitive papillæ of each side of the animal became fused together, and at the same time there appeared at each side of the tail a longitudinal eminence, a fold of the skin in continuation of the membranous base of the last papilla. These folds grew in height and assumed a triangular form, and, meeting near the apex of the tail, formed the caudal fin.

These facts, concludes Signore Trinchese, shed a vivid light on the phylogeny of *Lomanotus*, and demonstrate its descent from an ancestor having the form of an Æolid.

1889-1890.—Mr. W. Garstang, in a paper on the Nudibranchiate Mollusca of Plymouth Sound, published in vol. i. of the 'Journal of the Marine Biological Association of the United Kingdom,' records two captures of *Lomanotus* at Plymouth, one of three specimens ranging from $\frac{1}{2}$ to $\frac{3}{4}$ inch in length made in 1889, another of eight specimens

ranging from $\frac{1}{2}$ to $\frac{1}{4}$ inch made in the following year. These specimens vary considerably in colour. Two of those captured in 1889 are marbled brown like *L. marmoratus*, the third and largest is much lighter in colour, a pale fawn tinged with red, while the specimens taken in 1890 are "pale translucent orange." The sheath-margins of the rhinophores vary too. They are simple in the smaller 1889 specimens, while the larger one has "five or six blunt prominences or tubercles." Of those captured in 1890, the larger specimens have sheath-margins "produced into 4, 5, or 6 somewhat irregular processes of either simple papilla-like digitate or compressed triangular form," the smaller specimens have the sheath-margins simple. From a study of these specimens and of the descriptions of the six species of the genus established by Italian and British authors Mr. Garstang is led to reduce all to a single species, to which he assigns Vérany's name *L. genei*. He considers that the form of the tentacle sheath-margin may vary in this genus as it appears to vary in the allied genus *Tritonia*, and attributes the absence of lobing in the margins of *L. marmoratus* to immaturity of the specimen described by Alder and Hancock. Garstang is the first to draw attention to the characteristic mode of swimming of this species by a lashing of its body from side to side.

1892.—Mr. F. W. Gamble describes, in the Ann. & Mag. Nat. Hist., a nudibranch $\frac{1}{2}$ inch long dredged in the preceding year in Plymouth Sound. It resembles *C. marmoratus* in colour, but the sheath-margins have five papillæ. Having kept this animal living for some weeks, he not only notes its peculiar mode of swimming, but observes that the papillæ both of the sheath-margins and of the pleuropodium are capable of contraction and dilation. Following Garstang's lead, he names this specimen *L. genei*.

1896.—Mr. Gamble records, in the 'Irish Naturalist' (vol. v. p. 133), the finding in the previous year at Valentia Harbour, S.W. Ireland, of a stranded specimen of *L. genei* 2·inches long.

1900.—Mr. W. I. Beaumont, in a Report on the Opisthobranchiate Mollusca of Valentia Harbour (Proc. R. I. Acad. ser. 3, v. p. 842), rejects Mr. Gamble's identification of the large specimen found stranded in 1895 with Vérany's *L. genei*. He places this Valentia specimen, as well as two other large specimens he had recently found at Plymouth, under Thompson's *L. portlandicus*, which he equates with Norman's

L. hancocki, but is unable to follow Garstang in uniting with these the *L. marmoratus* of Alder and Hancock. He retains this latter as a distinct species (though he hints that it may be merely a colour-variety); he unites with it *L. flavidus* and refers to it small specimens of a marbled brown *Lomanotus* found on several occasions at Valentia Harbour, as well as the Plymouth specimens named *L. genei* by Mr. Gamble in 1892 and the two smaller Plymouth specimens found by Mr. Garstang in 1889. Having discussed Mr. Garstang's views as to the reduction of the six species of the genus to one, he concludes that there are really two British species—the large pellucid *L. portlandicus* and the small marbled brown *L. marmoratus*, with which latter he combines *L. flavidus*. But while conceding specific rank to *L. marmoratus*, he abandons as accidental Alder and Hancock's structural character drawn from the form of the sheath margins, and apparently bases its specific distinction solely on colour and size. As he has not had access to the original descriptions of either of the Mediterranean species, *L. genei* and *L. eisigi*, he hesitates to combine them positively with one or other of the two British species which he accepts, and merely suggests that these Italian forms may be placed under *L. portlandicus*.

1903.—Mr. G. P. Farran, in a paper on the Nudibranchiate Molluscs of Ballynakill and Bofin Harbours, Co. Galway ('Report on the Sea and Inland Fisheries of Ireland for 1901'), records the finding of numerous specimens of *Lomanotus* in Ballynakill Harbour in 1902. Of a small brown form no less than sixteen specimens were secured, the largest 2 cm. (or, say, $\frac{1}{2}$ inch) long; of a larger, rich, clear reddish-coloured form two specimens were taken, one 5·5 cm. the other 4 cm. long. All of the specimens, large and small, had dentated sheath-margins and were taken in quite shallow water from 1 to 4 fath. Following Mr. Beaumont's lead Mr. Farran refers the two large specimens to *L. portlandicus* and the numerous smaller specimens to *L. marmoratus*.

With these West Galway records this rather lengthy survey of the history of *Lomanotus* may conclude. It remains only to review the evidence which it offers for or against the existence of six distinct species of the genus, and to state concisely the conclusions which the evidence appears to warrant.

If we take one of the species as standard, and compare with

its description the original descriptions of the remaining five, omitting most of the purely generic characters and all specific characters derived from colour, the evidence will present itself in its clearest form. None of the six species is better suited for this purpose than *L. genei*, as none has been more fully described from mature examples. Let this, then, be taken as the standard, and the following table will exhibit all the structural differences which can be adduced as justifying the retention of the remaining five species. Vérany's character of the genus, drawn from the 'Revue Zoologique' of 1844 and the Acts of the Milan Congress of the same year, published in 1845, is placed at the head of the table for reference.

LOMANOTUS, Vérany (1844).

Body oblong, wedge-shaped; head as wide as the body, furnished with 4 small tentaculiform prolongations; dorsal tentacles 2, retractile, club-shaped, laminate, each included in a calyciform sheath; branchiae formed of 2 irregularly fringed and festooned membranes, attached longitudinally one to each side of the dorsal surface and to the tentacle-sheath; anal and genital orifices on the right side.

L. genei, Vérany.—Sheath-margins 4-lobed; pleuropodium reaching almost to the tail on either side.

L. marmoratus (Alder & Hancock).—Sheath-margins entire; pleuropodium not connected with the sheaths, but produced forwards in front of them.

L. flavidus (Alder & Hancock).—Sheath-margins tubercled; pleuropodium indistinct, its place marked by a marginal series of unequal-sized papillæ.

L. portlandicus, W. Thompson.—Sheath-margins divided into six finely pointed filaments; pleuropodium "commencing in front of the base of the sheaths and continuing behind the termination of the tail."

L. hancocki, Norman.—Sheath-margins with 5 divisions; rhinophores little longer than the sheaths, not laminated.

L. cavigii, Trinchesi.—Pleuropodium continuous round the body from sheath to sheath, its two lateral sections uniting at the apex of the tail and forming there a fin-like swimming-organ.

At a first glance it would seem as if specific value might fairly be conceded to the structural distinctions shown in this table. But when we come to examine into their claims more narrowly in the light of the facts brought out by the chronological survey just given, it will be seen that many of these characters lack the necessary certainty and permanence. In studying a group of soft-bodied animals such as the Nudibranch Mollusca, endowed, and often to a high degree, with

the power of expanding and contracting their tissues and of renewing lost or injured processes, it is only too easy to fall into errors of observation even when dealing with mature and perfect examples; it is extremely difficult to avoid such errors when the material is immature and defective. I shall not be wanting, then, in respect for the authors of the splendid 'Monograph of the British Nudibranchiate Mollusca' if I express the conviction that the peculiar structure of the pleuropodium shown in their plate of *L. marmoratus* is due to an error of observation. Vérany, so early as 1845 ('Atti della Sesta Riunione degli Scienziati Italiani'), mentions the attachment of the pleuropodium to the rhinophore-sheath as one of the characters of his genus *Lomanotus*, and subsequent research has shown that this attachment is properly generic.

As for the form of the sheath-margins, this is too variable to afford a satisfactory specific character. In the Bullock specimen described at the opening of this paper, for instance, the irregularity of one of the sheath-margins was such as to make it a matter of uncertainty whether its lobes or tuberculated divisions should be taken as four or five in number (the almost simple margin of the other sheath was probably due to accidental loss of the appendages). Again, some of Mr. Garstang's specimens captured at Plymouth in 1890 had the sheath-margins produced into four, five, or six irregular processes, while of the larger specimen taken in the preceding year he says that the sheath-margin had five or six blunt prominences or tubercles, the precise number of the marginal lobes being in this case apparently as hard to make out as in the Bullock specimen. Not only does the number of divisions in the sheath-margins vary, but, as Mr. Gamble has pointed out, their form in the same individual is variable, since the tubercular lobes are capable of contraction and dilation. It seems clear, then, that *L. marmoratus*, described from a single injured and apparently immature specimen, cannot be separated as a species from Vérany's *L. genei* by any certain structural character.

The claims of *L. flavidus* to specific rank may be more summarily dealt with. It is obviously an immature form of *Lomanotus* in one of the early stages of growth described by Trinchese in his paper on *L. esigii*, the stage when the rhinophore-sheath has just been formed, while the pleuropodium remains as yet undeveloped. It would be idle to speculate as to what final form might have been assumed by this immature specimen of Alder and Hancock. It might have grown into the likeness of Thompson's *L. portlandicus*;

it might just as well have developed into Trinchesse's *L. eisigi*, and so it must be dismissed as dubious.

The obscurity in Thompson's description of the pleuropodium in *L. portlandicus* has already been pointed out. Whether the continuation of the pleuropodium "behind the termination of the tail" points to any peculiarity of structure similar to the caudal fin of Trinchesse's species it is impossible to decide in the absence of a figure. The form of the divisions of its sheath-margin and the fact that they were six rather than four or five in number are in themselves insufficient as specific characters.

Apart from the number of divisions in its sheath-margin, the fourth British species, *L. hancocki*, is distinguished from previously described species merely by the form of the rhinophore, which is said to be non-laminate and scarcely longer than the sheath. There can be little doubt that in this case the rhinophores were examined when fully retracted, so that the smooth tips alone were visible, and that a dissection, if it had been made, would have shown their upper portions to possess the lamination characteristic of the genus.

On the whole, then, it appears that none of the structural features relied on as distinguishing the British species, *L. marmoratus*, *L. portlandicus*, and *L. hancocki*, from the Mediterranean species, *L. genei*, possesses the necessary certainty and constancy; and since colour *per se* cannot afford any valid specific character, the reduction to one of these four species appears to be fully justified.

So far it is easy to follow Mr. Garstang in his proposed fusion of the six species of *Lomanotus*. It is not possible, however, to go farther with him and sink Trinchesse's *L. eisigi*. The peculiar modification of its pleuropodium, whose character and development are so well described by the Italian scientist, fully entitles this form to specific rank and decisively forbids its fusion with the others.

To sum up, it is submitted that the evidence adduced in the historical survey just given warrants the reduction of the six species of the genus to the two species set out below, *L. flavidus* being dismissed as doubtful.

LOMANOTUS, Vérany, Revue Zoologique par la Société Cuvierienne, tome vii. p. 303 (1844).

L. marmoratus, Alder and Hancock, Ann. & Mag. Nat. Hist. vol. xvi. p. 311 (1845).

L. genei, Vérany, Catal. degli Animali invert. marini del Golfo di Genova e Nizza (1846).

Ann. & Mag. N. Hist. Ser. 8. Vol. ii.

L. portlandicus, Thompson, Ann. & Mag. Nat. Hist. ser. 3, vol. v. p. 50 (1860).

L. hancocki, Norman, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 518 (1877).

L. eisigi, Trinchese, Rendiconti dell' Accad. delle Scienze fisic. e matemat. di Napoli, Anno xxii. pp. 92-94 (1883).

As the name of the oldest component of the group of species here fused into one is clearly Alder and Hancock's *L. marmoratus*, that name must take precedence of Vérany's *L. genei*. It is true that Vérany all but anticipated Alder and Hancock in naming the first species of the genus when he dedicated to Prof. Gené at the Milan Congress of 1844 the nudibranch on which the genus was founded. But, however clear was his intention, he did not definitely give effect to it until 1846, when for the first time he assigned a Latin binomial to the animal.

The genus *Lomanotus* has a range in latitude of some $19\frac{1}{2}$ degrees, from Naples to Whalsey Skerries in the Shetlands, and a range in depth from 1 fathom in West Galway to upwards of 135 fathoms in the Gulf of Genoa. The first of the two species here accepted occupies in one or other of its forms the whole range of the genus, while the second species, *L. eisigi*, so far as I can ascertain, is confined to the Bay of Naples.

In conclusion, I wish to express my indebtedness to Dr. Scharff and to Mr. A. R. Nichols, of the Dublin Natural History Museum, as well as to Dr. Daydon Jackson, Secretary of the Linnean Society, and to Mr. R. W. Scully, F.L.S., for kind assistance given me in tracing and obtaining transcripts from some of the less accessible works here quoted from.

XXI.—List of *Batrachia and Reptilia* collected in Northern Matabeleland. By E. C. CHUBB, F.Z.S.

THIS material was collected for the Rhodesia Museum during November and the first week of December, 1907, while I was on an expedition to the Kana River, about 200 miles north of Bulawayo. A considerable amount of rain fell towards the end of November, with the result that great numbers of frogs and not a few tortoises made their appearance.

The altitude of the country traversed is between 4500 and and 3500 feet.

My best thanks are due to Mr. G. A. Boulenger, F.R.S., who has kindly named most of the specimens.

BATRACHIA.

1. *Bufo carens*, A. Smith.

a. Kana River, 20th Nov., 1907.

2. *Breviceps mossambicus*, Peters.

a-d. Near Gwamayaya River, 21st Nov., 1907.

This frog has a habit of retracting its head and limbs, inflating itself, and uttering a sharp shrill cry when one attempts to hit it. A creamy viscous fluid is exuded at the same time on the back. In its inflated condition it may be thrown or kicked about without any apparent injury.

3. *Phrynomantis bifasciata*, A. Smith.

a, b. Between Indabambi's and Gonye's, Shangani River, 28th Nov., 1907.

c, d. Gonda's, Bubi River, 3rd Dec., 1908.

The markings in this species appear to vary in colour to some extent, for in the two caught on 28th November they were a bright vermillion, whereas those caught at Gonda's on 3rd December were an orange colour. These colours rapidly fade in spirit and the markings appear white.

4. *Rana delalandii*, D. & B.

a. Gwamayaya River, 13th Nov., 1907.

5. *Rana adspersa*, Bibr.

a. Swena's, Gwamayaya River, 22nd Nov., 1907.

b, c. Near Inyati, 6th Dec., 1907.

a is a half-grown example, mottled green in colour, with a white dorsal stripe. b and c are full-grown and were taken from a pool where there must have been between one and two hundred altogether.

6. *Rana angolensis*, Bocage.

a-c. Gwamayaya River, 13th Nov., 1907.

7. *Rana mascareniensis*, D. & B.

a, b. Swena's, Gwamayaya River, 22nd Nov., 1907.

8. *Phrynobatrachus natalensis*, A. Smith.

a-q. Gwamayaya River, 13th Nov., 1907.

r-w. Kana River, 20th Nov., 1907.

Those from the Gwamayaya River were caught in the almost dried-up river-bed. The Kana River examples were taken from a pool in which there were great numbers of them, the noise made by them being almost deafening. It was not continuous, for there were intervals of silence at times until one commenced again, and then they all joined in together.

9. *Cassina senegalensis*, D. & B.

a. Kana River, 20th Nov., 1907.

b. Between Indabambi's and Gouye's, Shangani River, 29th Nov., 1907.

c. Gonda's, Bubi River, 3rd Dec., 1907.

This frog makes a peculiar shrill noise; it occasionally ascends trees, and was pointed out to me as a tree-frog.

REPTILIA.

CHELONIA.

10. *Cinixys belliana*, Gray.

a (young). Near Shangani River, Nov. 1907.

This young example agrees with the description and figure of that named *Homopus darlingi* by Mr. Boulenger *, but which he now considers to be simply a young specimen of the present species †. It possesses the normal five claws on each of the fore limbs.

Two full-grown examples were also found in pools near the Shangani River, but, unfortunately, they were lost from the waggon.

11. *Sternotherus nigricans*, Donnd.

a. Near Gwamayaya River, 22nd Nov., 1907.

b. Near Gwelo River, 24th Nov., 1907.

12. *Testudo pardalis*, Bell.

a. Near Gwamayaya River, 23rd Nov., 1907.

* P. Z. S. 1902, ii. p. 15.

† P. Z. S. 1907, p. 482, footnote.

LACERTILIA.

13. *Agama atricollis*, A. Smith.

a. Kana River.

This was shot on the branch of a tree. It has a curious habit of dodging one around the branch or trunk of the tree upon which it may happen to be. As soon as the present example saw me it ran round to the other side of the branch, and only by getting my "boy" to approach from the opposite side was I able to see it again and shoot it.

14. *Varanus niloticus*, L.

A half-grown monitor belonging to this species was shot on the bank of a creek of the Shangani River. On another occasion I watched one swimming in the water. It propelled itself slowly by means of its tail, while the limbs were used to keep its balance, in a similar manner to a person treading water.

OPHIDIA.

15. *Boodon lineatus*, D. & B.

a. Gwamayaya River, 13th Nov., 1908.

Shot on the bank of the river.

16. *Thelotornis kirtlandii*, Hallow.

a. Swena's, Gwamayaya River, 23rd Nov., 1907.

b. Near Gwamayaya River, 24th Nov., 1907.

Both shot on the ground away from water.

XXII.—*Descriptions of a new Frog and a new Snake from Formosa.* By G. A. BOULENGER, F.R.S.

Rhacophorus moltrechti.

Vomerine teeth in two strong, slightly oblique, transverse series touching the inner front edge of the choanæ and separated by an interspace less than the length of one of the series. Head moderately depressed, a little broader than long; snout rounded, slightly projecting beyond the lower jaw; canthus rostralis obtuse, loreal region deeply concave; nostril equally distant from eye and from end of snout; interorbital space a little broader than the upper eyelid; tympanum moderately distinct, two-thirds the diameter of the eye. Fingers rather short, outer half webbed, the disks as large as

the tympanum. Toes rather short, not fully webbed, the disks a little smaller than those of the fingers; inner metatarsal tubercle oval, flat. The tibio-tarsal articulation reaches the posterior border of the eye; length of tibia not half length of head and body. Skin smooth above, coarsely granular beneath. Green above, white beneath; axillar and lumbar regions with large black spots; sides of hind limbs bright orange with large black spots; interdigital membranes orange, spotted with black.

From snout to vent 45 mm.

Two female specimens from the Nanto district, Lake Candidje, Central Formosa, from the collection of Dr. Arnold Moltrecht.

Closely allied to *R. schlegelii*, Gthr.

Achalinus formosanus.

Head small, once and two-thirds as long as broad; rostral small, broader than deep, not visible from above; suture between the internasals a little shorter than that between the praefrontals; frontal slightly broader than long, three times as broad as the supraocular, about half as long as the parietals; loreal nearly three times as long as deep; temporals 2 + 2, the upper anterior in contact with the eye; three shields bordering the parietals on each side; six upper labials, first very small, fourth and fifth entering the eye, sixth much elongate; two pairs of large chin-shields, immediately followed by the ventrals. Scales unicarinate, in 27 rows. Ventrals 173; anal entire; subcaudals 64. Blackish above, the outer scales pale in the centre; labial, ventral, and caudal shields yellowish white, edged with blackish.

Total length 860 mm.; tail 140.

A single female specimen, obtained at Punkiho, Kagi district, Central Formosa, by Dr. A. Moltrecht.

XXIII.—Description of a new Fish of the Genus *Cichlosoma* from Tampico, with Notes on some other Fishes from Mexico and the Caribbean Sea. By C. TATE REGAN, M.A.

DURING a recent visit of Sir Frederic Johnstone's yacht 'Zenaïda,' R.Y.S., to Mexico and the Caribbean Sea a number of fishes were obtained. Several were caught with rod and line by Laura, Countess of Wilton, who has presented them to the British Museum, and others were collected by Dr. P. R. Lowe.

Among them are examples of a little blenny, *Enneanectes*

carminalis, Jord. & Gilbert species hitherto known only from Mazatlan, on the Pacific coast. These were captured by Dr. Lowe at Swan Island, between Honduras and Grand Cayman, and, so far as I can judge from comparison with the published descriptions and figures, they do not seem to differ from the Pacific coast form. The freshwater fishes include a large specimen of *Cichlosoma fenestratum*, Günth., from the R. Coaxacoalco, without cross-bars and with the lateral band quite black, extending forward to the eye, and on the sides occupying nearly the whole of the space below the lateral line. From Tampico were obtained several examples of *Cichlosoma steindachneri*, Jord. & Snyd., and two of a new fish for which I propose the name

Cichlosoma lauræ, sp. n.

Depth of body $1\frac{1}{2}$ in the length, length of head 3. Snout as long as postorbital part of head, with straight oblique profile. Diameter of eye $4\frac{1}{2}$ to 5 in the length of head, interorbital width $2\frac{1}{2}$ to $2\frac{3}{4}$. Depth of preorbital $1\frac{1}{2}$ to $1\frac{3}{4}$ the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; upper jaw with about 36 teeth in the outer series, gradually decreasing in size laterally; lower jaw with the anterior 8 or 10 teeth somewhat abruptly differentiated from the smaller lateral teeth. Cheek with 5 or 6 series of scales. 7 gill-rakers on the lower part of the anterior branchial arch. Scales 28 $\frac{5-6}{12-15}$, 2½ or 3 between lateral line and scaly sheath at base of anterior part of soft dorsal. Dorsal XV 11, commencing above the opercular cleft, the spines increasing in length to the fifth or sixth, thence subequal or slightly increasing, the last $\frac{1}{2}$ the length of head; soft fin, when laid back, extending about to the middle of caudal. Anal V 8-9. Pectoral shorter than the head, not extending to above the anal; outer ventral ray more or less produced, nearly or quite reaching the origin of anal. Caudal rounded. Caudal peduncle $\frac{3}{4}$ as long as deep. Olive-brown, with blue (turquoise or ultramarine; according to Dr. Lowe's notes) spots on the head and body, one on each scale, the ground-colour in places reduced to a dark reticulation; soft vertical fins with similar spots.

Hab. Tampico.

Two specimens, 190 and 230 mm. in total length.

The nearest ally of this species is *C. macracanthum*, Günth., which is distinguished by the coloration, the shorter snout and narrower preorbital, the somewhat different dentition, the more numerous gill-rakers, and the longer pectoral fin.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

April 15th, 1908.—Dr. J. J. Harris Teall, M.A., F.R.S.,
Vice-President, in the Chair.

The following communication was read:—

'Notes on the Geology of Burma.'
By Leonard V. Dalton, B.Sc., F.R.G.S.

The object of this paper is to present the results of geological expeditions in the Irawadi Valley, carried out by the Author and Mr. W. H. Dalton between 1904 and 1906, and to correlate these observations with those made by previous writers, thus summarizing present knowledge of the geology of Burma in general and of the Tertiary System in particular. The classification of rocks arrived at is shown in the following table:—

		FEET.	
Irawadi Series		20,000 (?)	Pliocene.
Arakan Series { Pegu Group		7500	Miocene.
Bassein Group		8000	Eocene.
Axial Series { Upper { Cardita-Beds	Cretaceous.
	{ Halobia-Limestone	Triassic.
	{ Shales and grits	(?)
	Lower. Flabby shales and sandstones.	(?)

The oldest rocks, not comprised in the above synopsis, include representatives of the Silurian, Devonian, and Carboniferous Systems, but little of their detailed geology is known. The *Cardita-Beds* may be correlated with the Cretaceous of India. The 'Chin Shales' of Dr. Nestling seem to form part of the Bassein Group, of Eocene age, which is of much greater thickness than hitherto supposed, and the group rests presumably more or less conformably on the beds below. The fauna is chiefly shallow marine in facies. These rocks flank the Arakan Group on both sides and in the south form the backbone of the range, where they have been considerably metamorphosed. The Pegu Group probably overlaps the preceding and is regarded as of Miocene age, although the fauna has many relationships with that of the French Eocene. *Lucina globulosa* is described as the first European Miocene species recorded from Burma. Estuarine conditions came on towards the close of Miocene time, and, in the estuary of the Pliocene precursor of the Irawadi, anticlinal islands of partly-consolidated Miocene materials were formed. Around, and eventually over these islands a great thickness of fluviatile deposits was laid down, corresponding to the Siwalik Beds of the Indian Peninsula. Finally, post-Pliocene denudation and upheaval revealed the Miocene islands as inliers, while the Irawadi has left its gravels in patches throughout the region. A list of fossils is given, and the species new to Burma, some of them new to science, are described.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 9. SEPTEMBER 1908.

XXIV.—*A Preliminary Revision of the Irish Char.*
By C. TATE REGAN, M.A.

CHAR are Salmonoid fishes of the genus *Salvelinus*, which differs from *Salmo* (salmon and trout) in having the vomerine teeth present only as a group on the head of the bone, which is raised and has a boat-shaped depression behind it. Within the Arctic Circle and southwards to Iceland, Hudson Bay, and the Kurile Islands migratory char are found, which descend to the sea in the spring and towards the winter re-enter the rivers to spawn. In these high latitudes also many of the lakes are inhabited by permanently freshwater colonies, which have found the conditions of life favourable enough to induce them to abandon their habit of migrating to the sea, whilst in some cases they have become land-locked, so that they could not now migrate even if they wished to. Some of these freshwater colonies differ sufficiently from the migratory parent species to be recognized as distinct species or races; thus in Iceland the non-migratory *Salvelinus nivalis* may be distinguished from the migratory *S. alpinus*.

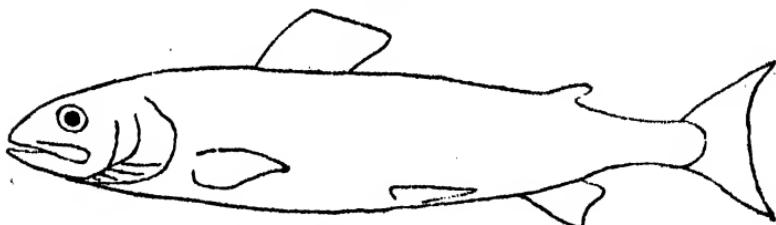
Further south all the char are non-migratory and are principally restricted to deep cold lakes; on the Continent of Europe they are found in the lakes of Scandinavia, Switzerland, and the Tyrol, and in the British Isles they occur in Scotland, the Lake District, North Wales, and Ireland.

There can be little doubt that when the temperature of the Northern Hemisphere was lower, as during the glacial epoch, migratory char were to be found much further south than at the present day, and that the char of the British Isles, Scandinavia, and Central Europe represent a number of lacustrine colonies of one or a few migratory ancestral forms.

The char of each lake or each system of lakes have been isolated for a considerable time and have become differentiated to a greater or less extent; the study of the different forms is one of great interest. I have for some time been trying to get together a good series of the char of the British Isles for the National Collection, but progress has been slow, and it has seemed to me worth while to publish this preliminary account of the Irish char in order to call attention to the subject.

In 1841 (*Ann. & Mag. Nat. Hist.* vi.) Thompson gave an interesting account of the Irish char, which he recorded from lakes in Donegal, Galway, and Waterford, and also from Lough Melvin in Fermanagh, Loughnabrack in Longford, Lough Eaghish in Monaghan, and Lough Dan in Wicklow. He described the char or "freshwater herring" of Lough Melvin, and noted some of its peculiarities, including the difficulty of distinguishing the sexes from external characters, writing "some of the largest finned are females." He also noted that in the lakes at the source of the River Lee in Cork, not long before celebrated for their fine char, these fish were apparently extinct in 1839. Similarly the char or "whiting" of Lough Neagh, formerly abundant, was quite extinct in 1837.

Fig. 1.



The extinct "Whiting" of Lough Neagh.

An account of this last-named fish was contributed to Dubourdieu's 'History of the County of Antrim,' published in 1812. The accompanying figure, although very inaccurate, is perhaps sufficiently interesting for me to reproduce a tracing, considerably reduced.

In 1862 and 1863 Dr. Günther described the char of Lough Melvin and Lough Eask as *Salmo grayi* and *S. colii* respectively. Since that time no serious study of the Irish char has been attempted, but most writers have agreed in regarding all the char of the British Isles as forms of the northern migratory *S. alpinus*, L. If this be so, I have no hesitation in saying that all char (*S. fontinalis* possibly excepted) must be included in *S. alpinus*, and I think it is simpler to keep to the binomial nomenclature and to call the Lough Melvin char *Salvelinus grayi* in preference to *Salvelinus alpinus grayi* or *Salvelinus alpinus*, var. *grayi*. In either case, whether we recognize only one species of char, *Salvelinus alpinus*, or numerous species, *S. grayi*, *S. colii*, &c., the species is by no means equivalent to species such as *Esox lucius* or *Leuciscus rutilus*, which have probably persisted unchanged during the whole of the time that the evolution of the *Salvelini* has been taking place.

The present revision is based on the specimens in the British Museum and also on the collection of the Dublin Museum, kindly sent to me on loan.

Synopsis of the Species.

I. Snout conical, pointed; jaws equal anteriorly or the lower slightly projecting; lower jaw pointed; 13 or 14 gill-rakers on the lower part of the anterior branchial arch; interorbital region more or less convex.

Teeth moderate; snout $1\frac{1}{2}$ as long as eye (in a specimen of 280 mm.), less than interorbital width, which is 3 in the length of head; 186 scales in a longitudinal series* 1. *scharffi*.

Teeth strong; snout $1\frac{1}{2}$ as long as eye (in a specimen of 205 mm.), slightly more than interorbital width, which is $3\frac{1}{2}$ in the length of head; 165 scales in a longitudinal series 2. *trevelyanii*.

II. Snout subconical, decurved; jaws equal anteriorly, the lower more or less pointed.

A. 12 to 16 gill-rakers on the lower part of the anterior branchial arch; interorbital region more or less convex, its width 3 (adult) to $3\frac{1}{2}$ (young) in the length of head.

Depth of body 4 to 5 in the length; least depth of caudal peduncle about $\frac{1}{3}$ the length of head; pectoral fin extending $\frac{1}{2}$ to $\frac{2}{3}$ of the distance from its base to the origin of pelvics; 188 to 198 scales in a longitudinal series 3. *colii*.

* The number of scales in a longitudinal series is counted above the lateral line and does not include the scales covering the base of the caudal fin. The scales descend to the lateral line in regular oblique series and are easily counted.

Depth of body $3\frac{1}{2}$ to 4 in the length; least depth of caudal peduncle $\frac{1}{2}$ or nearly $\frac{1}{2}$ the length of head; pectoral fin extending $\frac{2}{3}$ to $\frac{1}{2}$ of the distance from its base to the origin of pelvics; 128 to 162 scales in a longitudinal series 4. *grayi*.

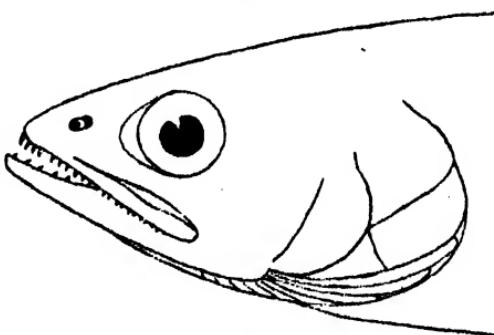
B. 18 or 19 gill-rakers on the lower part of the anterior branchial arch; interorbital region flat, its width $3\frac{1}{2}$ (young) in the length of head; 160 scales in a longitudinal series.... 5. *fimbriatus*.

III. Snout obtuse, decurved; lower jaw rounded anteriorly, shorter than and included within the upper; 13 to 15 gill-rakers on the lower part of the anterior arch; interorbital region flat, its width $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head; 142 to 166 scales in a longitudinal series 6. *obtusus*.

1. *Salvelinus scharffi*, sp. n.

Depth of body $4\frac{2}{3}$ in the length, length of head $4\frac{1}{2}$. Snout conical, pointed, $1\frac{1}{3}$ as long as eye, the diameter of which is 5 in the length of head. Interorbital region slightly convex, its width 3 in the length of head. Dentition moderate; lower jaw slightly projecting; maxillary extending to below the posterior margin of pupil or a little beyond, its length $2\frac{2}{3}$ to $2\frac{3}{4}$ in the length of head; lower jaw pointed anteriorly, its length $1\frac{1}{3}$ in the length of head. 10 branchiostegals. 13 or 14 gill-rakers on the lower part of anterior arch, the longest less than $\frac{2}{3}$ the diameter of eye. 186 scales in a longitudinal

Fig. 2.



Salvelinus scharffi.

series. Dorsal 13, with 9 branched rays, its origin a little nearer to the tip of snout than the base of caudal, the longest ray $\frac{2}{3}$ the length of head. Anal 12, with 8 branched rays. Pectoral $\frac{2}{3}$ the length of head, extending $\frac{1}{2}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle nearly 2 in its length and a little more than $\frac{1}{2}$ the

length of head. Silvery; back bluish grey; dorsal, caudal, and pectoral fins dusky; pelvics and anal pale.

Hab. Lough Owel in Westmeath.

A single specimen, 280 mm. in total length.

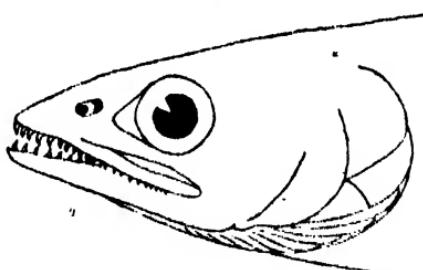
This species differs from *S. colii* in having the scales smaller, the snout more pointed, and the mouth more oblique and smaller, the maxillary having the same relative length as in specimens of *S. colii* of 200 mm.

I have named it after Dr. R. Scharff, to whom I am indebted for the opportunity of describing it, in recognition of the favours I have received from him during my work on Irish fishes.

2. *Salvelinus trevelyani*, sp. n.

Depth of body 5 in the length, length of head 4. Snout conical, pointed, considerably longer than eye, the diameter of which is $\frac{5}{6}$ in the length of head. Interorbital region convex, its width $\frac{3}{4}$ in the length of head. Dentition strong; cleft of mouth oblique; jaws equal anteriorly; maxillary extending nearly to below the posterior margin of eye, its length $2\frac{1}{2}$ in the length of head; lower jaw pointed anteriorly,

Fig. 3.



Salvelinus trevelyani.

its length $1\frac{1}{2}$ in the length of head. 9 or 10 branchiostegals, 14 gill-rakers on the lower part of anterior arch, the longest $\frac{3}{4}$ the diameter of eye. 165 scales in a longitudinal series. Dorsal 13, with 9 branched rays, its origin a little nearer to the tip of snout than the base of caudal, the longest ray a little more than $\frac{3}{4}$ the length of head. Anal 11, with 7 branched rays. Pectoral $\frac{4}{3}$ the length of head, extending $\frac{3}{4}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle 2 in its length and $\frac{1}{3}$ the length of head. Scattered rounded spots on the sides; fins dusky.

Hab. Lough Finn in Donegal.

A single specimen (δ), 205 mm. in total length.

This species is closely allied to *S. colii*, differing in the longer head, produced pointed snout, strong teeth, &c.

I have named it after the donor, Major H. Trevelyan, to whom the British Museum is also indebted for a fine series of the fishes of Lough Erne.

3. *Salvelinus colii*.

Salmo colii, Günth. Proc. Zool. Soc. 1863, p. 12, pl. ii., and Cat. Fish. vi. p. 138 (1866); Day, Fish. Britain, p. 114, pl. cxviii. fig. 2 (1884).

Depth of body 4 to $4\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$ to $4\frac{3}{4}$. Snout subconical, with upper profile decurved anteriorly, as long as or a little longer than eye, the diameter of which is $4\frac{1}{2}$ to $4\frac{3}{4}$ in the length of head. Interorbital region slightly convex, its width 3 to $3\frac{1}{2}$ in the length of head. Dentition feeble or moderate; jaws equal anteriorly; maxillary extending to below the posterior margin of pupil or beyond, its length $2\frac{3}{4}$ to $2\frac{7}{8}$ in the length of head; lower jaw pointed anteriorly, its length $1\frac{3}{5}$ to $1\frac{4}{5}$ in the length of head. 8 to 12 branchiostegals. 13 to 16 gill-rakers on the lower part of anterior arch, the longest about $\frac{2}{3}$ the diameter of eye. 138 to 168 scales in a longitudinal series. Dorsal 13-15, with 9 or 10 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray $\frac{3}{4}$ to $\frac{4}{5}$ the length of head. Anal 11-14, with 7 to 9 branched rays. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ the length of head, extending from $\frac{1}{4}$ to nearly $\frac{2}{3}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle $1\frac{1}{2}$ to 2 in its length and about $\frac{2}{3}$ the length of head. 62 or 63 vertebrae. Bluish black above, silvery or orange below; sides with orange spots; fins dusky.

Hab. Lough Eske (Eask) in Donegal.

Here described from twelve examples, 170 to 210 mm. in total length.

Char from Lough Derg in Donegal, Lough Conn in Mayo, and Loughs Mask and Inagh in Galway are essentially identical with the Lough Eske form.

A single example (δ) from Lough Derg, 200 mm. in total length, has all the characters of the Lough Eske char.

Two examples (δ) from Lough Conn measure 290 and 230 mm. in total length. In each the dorsal fin has 9 and the anal 8 branched rays. There are 154 to 160 scales in a longitudinal series and 13 or 14 gill-rakers on the lower part of the anterior arch.

Three char from Lough Mask, recently presented to the British Museum by Alick Duncan, Esq. (2), and Godfrey Allen, Esq. (1), measure 240 to 260 mm. in total length. In them I count 8 or 9 branched rays in the dorsal fin, 7 or 8 in the anal, and 148 to 166 scales in a longitudinal series. In one of them the vertebrae number 62. The gill-rakers are rather shorter than in *S. colii* from other localities, the longest measuring $\frac{1}{2}$ the diameter of the eye.

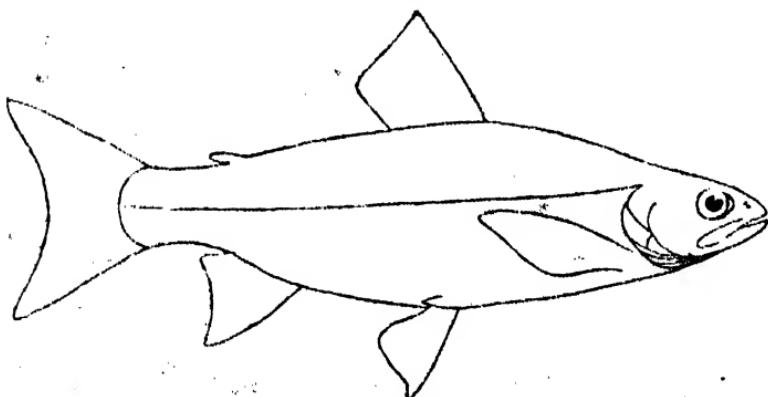
In a single small specimen (?) from Lough Inagh, 150 mm. in total length, I count 10 branched rays in the dorsal fin, 7 in the anal, 160 scales in a longitudinal series, and 14 gill-rakers on the lower part of the anterior arch. The longest gill-rakers are nearly equal to $\frac{1}{2}$ the diameter of the eye.

4. *Salvelinus grayi*.

Salmo grayi, Günth. Proc. Zool. Soc. 1862, p. 51, pl. vii., 1863, p. 12, and Cat. Fish. vi. p. 136 (1866); Day, Fish. Britain, p. 114, pl. cxix. fig. 1 (1884).

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head 4 to $4\frac{3}{4}$. Snout subconical, with upper profile decurved anteriorly, longer than eye, the diameter of which is $4\frac{1}{2}$ to 5 in the length of head. Interorbital region convex, its width 3 in

Fig. 4.



Salvelinus grayi (after Günthor).

the length of head. Dentition feeble; jaws equal anteriorly; maxillary extending nearly to below the posterior margin of eye or a little beyond, its length $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length of head; lower jaw pointed anteriorly, its length $1\frac{1}{2}$ to $1\frac{3}{4}$ in

the length of head. 9 to 12 branchiostegals. 12 to 15 gill-rakers on the lower part of anterior arch, the longest $\frac{1}{2}$ to $\frac{1}{3}$ the diameter of eye. 128 to 162 scales in a longitudinal series. Dorsal 12-15, with 8 to 10 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray from $\frac{3}{5}$ to as long as the head. Anal 11-14, with 7 to 9 branched rays. Pectoral $\frac{8}{5}$ to $1\frac{1}{6}$ the length of head, extending $\frac{3}{5}$ to $\frac{9}{10}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle $1\frac{1}{2}$ to $1\frac{2}{3}$ in its length and $\frac{1}{2}$ or nearly $\frac{1}{2}$ the length of head. 59 or 60 vertebræ. Bluish black above, silvery below, sometimes shaded with orange; back and sides sometimes with small pale spots; fins dusky.

Hab. Lough Melvin in Fermanagh.

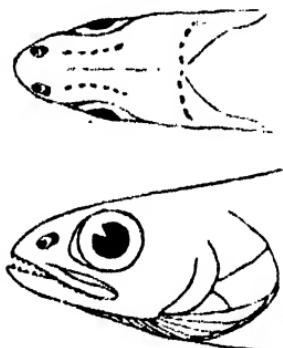
Here described from twenty-six examples, 210 to 260 mm. in total length.

Of the sixteen specimens in the British Museum only one is a female; this has the pectoral fin longer than the head.

5. *Salvelinus fimbriatus*, sp. n.

Depth of body $4\frac{2}{3}$ in the length, length of head $4\frac{2}{3}$. Snout subconical, with upper profile decurved anteriorly, as long as eye, the diameter of which is $4\frac{1}{4}$ in the length of head. Interorbital region flat, its width $3\frac{1}{2}$ in the length of head. Dentition moderate; jaws equal anteriorly; maxillary

Fig. 5.



Salvelinus fimbriatus. Head from above and from the side.

extending to below the posterior margin of pupil, its length $2\frac{1}{2}$ in the length of head; lower jaw pointed anteriorly, its length nearly $1\frac{1}{2}$ in the length of head. 10 branchiostegals. 18 or 19 gill-rakers on the lower part of anterior arch, the

longest $\frac{1}{2}$ the diameter of eye. 160 scales in a longitudinal series. Dorsal 14, with 10 branched rays, its origin nearer to the tip of snout than the base of caudal, the longest ray $\frac{2}{3}$ the length of head. Anal 12, with 8 branched rays. Pectoral $\frac{3}{4}$ the length of head, extending nearly $\frac{3}{5}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle $1\frac{1}{2}$ in its length and $\frac{2}{3}$ the length of head. Back and sides brownish (in spirit); sides with rounded spots; abdomen silvery; fins dusky.

Hab. Lough Coomasaharn in Kerry.

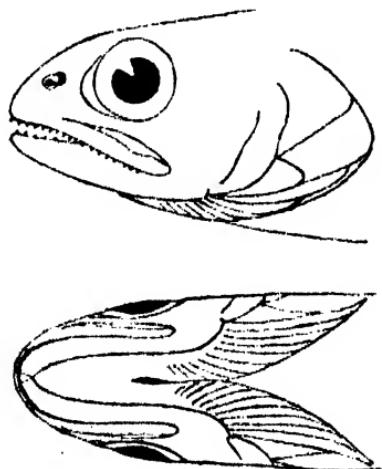
Here described from a single specimen (♀) 155 mm. in total length.

This form resembles *S. colii*, but differs in the narrow, flat, interorbital region and the numerous gill-rakers, the latter feature suggesting the specific name.

6. *Salvelinus obtusus*, sp. n.

Depth of body 4 to 5 in the length, length of head $4\frac{1}{5}$ to $4\frac{2}{3}$. Snout obtuse, with upper profile decurved throughout, not or scarcely longer than eye, the diameter of which is $4\frac{1}{4}$ to $4\frac{1}{2}$ in

Fig. 6.



Salvelinus obtusus. Head from the side and from below.

the length of head. Interorbital region flat, its width $3\frac{1}{3}$ to $3\frac{3}{4}$ in the length of head. Dentition feeble or moderate; lower jaw a little shorter than and included within the upper;

maxillary extending to below the middle, posterior part or posterior margin of eye, its length $2\frac{1}{2}$ to 3 in the length of head; lower jaw rounded anteriorly, its length $1\frac{2}{3}$ to $1\frac{4}{5}$ in the length of head. 9 to 12 branchiostegals. 12 to 15 gill-rakers on the lower part of anterior arch, the longest $\frac{1}{4}$ to $\frac{2}{5}$ the diameter of eye. 142 to 166 scales in a longitudinal series. Dorsal 13-15, with 9 to 11 branched rays, its origin a little nearer to the tip of snout than the base of caudal, the longest ray $\frac{3}{5}$ to $\frac{2}{3}$ the length of head. Anal 12 to 15, with 8 to 11 branched rays. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ the length of head, extending $\frac{1}{2}$ to $\frac{2}{3}$ of the distance from its base to the base of pelvics. Least depth of caudal peduncle $1\frac{1}{3}$ to $1\frac{2}{3}$ in its length and about $\frac{2}{3}$ the length of head. 62 vertebræ. Brownish or purplish above, silvery or orange below; fins dusky.

Hab. Lough Luggala in Wicklow.

Here described from fourteen examples, 140 to 200 mm. in total length.

Char from Lough Dan in Wicklow and from Killarney and Lough Acoose in Kerry are similar to the char of Lough Luggala.

A single specimen (♀) from Lough Dan measures 145 mm. in total length; it agrees entirely with the Lough Luggala char. There are 9 branched rays in both dorsal and anal, 164 scales in a longitudinal series, and 14 gill-rakers on the lower part of the anterior arch.

Two specimens (♀) from Lough Acoose measure 145 and 185 mm. in total length. They have 9 or 10 branched rays in the dorsal and 8 in the anal fin, 148 and 152 scales in a longitudinal series, and 14 or 15 gill-rakers on the lower part of the anterior arch. The caudal peduncle is $1\frac{2}{3}$ to 2 as long as deep. The larger specimen has the sides well spotted.

In a single example (♂) from Killarney, 210 mm. in total length, the dorsal has 10 and the anal 9 branched rays. There are 166 scales in a longitudinal series and 15 gill-rakers on the lower part of the anterior arch, the longest nearly $\frac{1}{2}$ the diameter of eye. The pectoral fin is $\frac{2}{3}$ the length of head and extends a little more than $\frac{2}{3}$ of the distance from its base to the origin of the pelvics.

XXV.—A Collection of Bats from Formosa. By AUGUSTA
ÅRNBÄCK-CHRISTIE-LINDE, Zootomical Institute, University
of Stockholm.

THE Zootomical Institute lately received from Mr. Hans Sauter a collection of bats from Formosa which Professor Leche submitted to me for identification.

As there are in this collection a new species of *Myotis* and other bats but little known or not before recorded from this island, I hope the following list will be of some interest.

Myotis taiwanensis, sp. n.

6 ♂, 9 ♀. Takao, Anping, Tainan, Formosa; July, September, October, 1906-1907.

Teeth.—The upper incisors are almost equal in size. The outer cusp of the bifid inner incisors is decidedly shorter than the inner. pm^2 (middle upper premolar) is small, but distinctly visible from without, and situated in the tooth-row; p^1 and p^2 are therefore quite separated.

In the lower jaw pm^2 is reduced in size, but not internal to the tooth-row.

Ear.—Inner margin of the ear-conch straight below, faintly convex above, with a slight flattening below the tip. Outer margin not very deeply emarginated, straight above, terminating opposite the base of the inner margin in a lobe. The tip of the ear is obtusely rounded. Ears shorter than the head; their extremities do not reach the end of the muzzle when laid forwards.

Tragus straight, of about the same shape as in *Myotis daubentonii*; the inner margin straight, the outer faintly convex; somewhat narrower towards the tip, which is rounded and reaches the middle of the inner margin of the ear-conch.

Colour (so far as can be determined from preserved specimens).—Fur yellowish brown above, dark brown with white extremities beneath. Interfemoral membrane and ears light brown, wing-membrane dark brown.

Measurements.—*Myotis taiwanensis* is of about the same size as *M. adversus*.

	♂. mm.	♀. mm.
Skull, total length to front of incisors	15·5	..
Length, head and body	49	..
" tail	38	39
" head	18	..

	♂. mm.	♀. mm.
Length, ear, outer margin	16	..
" greatest breadth	8	..
" tragus, outer margin	8	..
" forearm	40	41
3rd finger, metacarpus	34	36
" first phalanx	12	13
" 2nd phalanx	9	10
4th finger, metacarpus	34	35
" 1st phalanx	11	..
" 2nd phalanx	8	..
5th finger, metacarpus	33	..
" 1st phalanx	10	..
" 2nd phalanx	7	..
Thumb, with claw	8	..
Lower leg	18	..
Foot, with claws	11	..

Other external characters.—Last tail-vertebra projects beyond the membrane. The wing-membrane is attached to the ankle. Calcaneum very long, reaching about two-thirds the distance from the ankle to the last tail-vertebra.

Claws rather long. The interfemoral membrane forms an acute angle in the centre of its margin behind.

Affinities.—According to Dobson *, who in his Catalogue has divided the genus *Vespertilio* (*Myotis*) into the two subgenera *Leuconoë* and *Vespertilio*, *Myotis taiwanensis* should be referred to the former subgenus. Among hitherto known species it seems to be nearest allied to *M. adversus*, as Dobson has described it (*l. c.*), but differs from that species chiefly with regard to the premolars, which agree with those of *M. dryas*, a near ally of *M. adversus* and lately described by K. Andersen †. As regards the incisors, *M. taiwanensis* agrees with *M. adversus* and not with *M. dryas*.

Hab. Island of Formosa (Taiwan).

This species and *Myotis formosus* are, so far as I know, the only species of *Myotis* hitherto recorded from Formosa.

Pipistrellus abramus, Temm.

11 ♂, 17 ♀. Takao, Anping, Kagi, Formosa; May, July, August, September, October, 1906–1907.

The collection contains both adult and young specimens, varying somewhat in the colour of the fur, which may

* G. E. Dobson, 'Catalogue of the Chiroptera in the British Museum' (London, 1878).

† Knud Andersen, 'Annali d. Mus. Civ. d. Storia naturale di Genova,' ser. 3, vol. iii. (1907).

depend on their having been taken in different seasons. Apart from this they agree with Dobson's description.

Miniopterus schreibersi japonicus, Thomas.

21 ♂, 27 ♀. Tainan, Formosa; October 1906.

This genus has not before been recorded from Formosa. The specimens in the collection agree best, as regards size and colour, with Thomas's* description of this species. I will only remark that the length of head and body of these specimens varies from 50 to 56 mm.

Rhinolophus monoceros, Andersen.

2 ♂. Kagi, Takao, Formosa; May, October, 1907.

Only one species of the genus *Rhinolophus*, *R. monoceros*, represented by a single specimen, has hitherto been recorded from Formosa. In his paper "On Bats of the Genus *Rhinolophus*"† Andersen gives a short description of this specimen (a not full-grown female), the only one known to him.

There are two *Rhinolophi* in the collection submitted to me for determination; both of them are males. I have identified them as *Rhinolophus monoceros*, with which species the connecting-process, the size, and the locality agree rather closely.

The connecting-process is somewhat broader at the base and not quite so slender in one specimen as in the other, which entirely agrees with Andersen's text-figure 22, c, p. 121 (l. c.); but as I cannot find any other notable difference, I have not hesitated to refer it to the aforesaid species.

As the specimen described by Andersen is a female and only a few measurements are given by him, I hope the following table will be of some use:—

Measurements (♂ ad.).

	mm.
Ears, length	17
" greatest breadth above antitragus .	11·5
Nose-leaves, total length	10·5
Horseshoe, breadth	6·5
Forearm	36·5
3rd finger, metacarpus	26·5
" 1st phalanx	11
" 2nd phalanx	13

* Oldfield Thomas, "On Mammals from Japan," Proc. Zool. Soc. London, 1905, ii. p. 338.

† Knud Andersen, Proc. Zool. Soc. London, 1905, ii. p. 131.

	mm.
4th finger, metacarpus	27
" 1st phalanx	9
" 2nd phalanx	10
5th finger, metacarpus	27
" 1st phalanx	9
" 2nd phalanx	10
Tail	18·5
Lower leg	16
Foot	7

XXVI.—*Diagnoses of new Fishes discovered by Capt. E. L. Rhoades in Lake Nyassa.* By G. A. BOULENGER, F.R.S.

A LARGE collection of fishes from Lake Nyassa, comprising examples of thirty-four species, twelve of which are undescribed, has been presented by Capt. E. L. Rhoades to the British Museum. Most of the specimens are in an excellent state of preservation, and their value is much enhanced by coloured sketches made by Capt. Rhoades himself from them in the fresh condition. Thanks to this rich material, I hope ere long to prepare for publication an illustrated account of the fishes of Lake Nyassa. In the meanwhile I have drawn up diagnoses of the new species.

Barbus rhoadesii.

D. IV 8. A. III 5. L. lat. 37–40. L. tr. $\frac{6\frac{1}{2}-7\frac{1}{2}}{6}$.

Depth of body $3\frac{2}{3}$ to $3\frac{3}{4}$ times in total length, length of head $3\frac{2}{3}$ to 4 times. Snout rounded, $3\frac{1}{2}$ to $3\frac{3}{4}$ times in length of head, eye 5 times, interorbital width $3\frac{2}{3}$ to 4 times; width of mouth 3 to $3\frac{1}{2}$ times in length of head; lips moderately developed, interrupted on the chin; barbels 2 on each side, anterior minute, posterior $\frac{1}{3}$ to $\frac{1}{2}$ diameter of eye. Last simple ray of dorsal very strong, bony, not serrated, rigid portion about $\frac{1}{4}$ length of head. Ventrals immediately in front of origin of dorsal. Caudal peduncle $1\frac{2}{3}$ to $1\frac{3}{4}$ times as long as deep. 3 or $3\frac{1}{2}$ scales between lateral line and ventral, 16 or 18 round caudal peduncle. Olive to dark green above, white beneath.

Six specimens, measuring 250 to 325 mm.

*Paratilapia chrysonota.*D. XV-XVI 9-11. A. III 9-11. Sc. 32-34 $\frac{8-9}{10}$.L. I. $\frac{21-27}{12-18}$.

Depth of body $2\frac{3}{4}$ to $2\frac{5}{4}$ times in total length, length of head 3 to $3\frac{1}{2}$ times. Eye $2\frac{1}{2}$ to 3 times in length of head, as long as or longer than snout, as long as postocular part of head; maxillary extending to between nostril and eye; lower jaw not projecting; teeth very small, in 3 or 4 series; 2 or 3 series of scales on the cheek; 17 to 20 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures $\frac{2}{3}$ to $\frac{1}{2}$ length of head; soft dorsal and anal pointed. Pectoral as long as or a little longer than head. Caudal fin feebly emarginate, feebly scaled. Caudal peduncle a little longer than deep. Scales finely denticulate. Female brownish above and silvery white beneath, with 3 black spots on each side; these spots less distinct in males, which are much darker, with the top of the head and back golden yellow, and the dorsal and anal yellow, usually black at the base.

Numerous specimens, measuring 70 to 130 mm.

Closely allied to *P. intermedia*, Gthr.

*Paratilapia rhoadesii.*D. XVI-XVII 12. A. III 10-11. Sc. 37-38 $\frac{4-5}{12-14}$.L. I. $\frac{25-26}{15-17}$.

Depth of body equal to length of head, 3 times in total length. Eye 5 to $5\frac{1}{2}$ times in length of head, 2 to $2\frac{1}{2}$ times in length of snout; maxillary extending to between nostril and eye; lower jaw not or but slightly projecting; teeth in 4 or 5 series, outer largest; 5 series of scales on the cheek; 11 gill-rakers on lower part of anterior arch. Dorsal spines equal from 8th or 9th, not quite $\frac{1}{3}$ length of head. Pectoral a little shorter than head. Caudal fin deeply emarginate and densely scaled. Caudal peduncle $1\frac{1}{2}$ to $1\frac{3}{4}$ times as long as deep. Scales finely denticulate. Dark green above, pale green or silvery below, with 7 or 8 ill-defined darker vertical bars on the body; fins edged with yellow.

Total length 360 mm. Two specimens.

Closely allied to *P. dimidiata*, Gthr.

Paratilapia compressiceps.

D. XV 12. A. III 11. Sc. 35 $\frac{4}{11}$. L. l. $\frac{23}{16}$.

Depth of body 3 times in total length, length of head $2\frac{3}{5}$ times. Head very strongly compressed; eye $5\frac{1}{2}$ times in length of head, $2\frac{1}{2}$ times in length of snout; maxillary widely separated from vertical of anterior border of eye; chin pointed, projecting; teeth in 3 series, outer large and widely spaced; 4 series of scales on the cheek; 10 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures $\frac{1}{3}$ length of head. Pectoral $\frac{2}{3}$ length of head. Caudal fin truncate. Caudal peduncle $1\frac{1}{2}$ times as long as deep. Scales finely denticulate. Brownish above, silvery white beneath; three dark bands on each side, one along the upper outline of head and body, the other above the upper lateral line, and a third from the praorbital to the base of the caudal, passing through the eye.

A single specimen, 165 mm. long.

Allied to *P. serranus*, Hilg., and *P. prognatha*, Pellegr.

Paratilapia cœrulea.

D. XVI 13. A. III 10. Sc. 38 $\frac{4-5}{12}$. L. l. $\frac{23}{17}$.

Depth of body 4 times in total length, length of head $3\frac{1}{2}$ times. Eye 6 times in length of head, $2\frac{1}{2}$ times in length of snout; maxillary widely separated from vertical of anterior border of eye; lower jaw slightly projecting; teeth in 4 series, outer large and widely spaced; 5 series of scales on the cheek; 11 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures $\frac{1}{3}$ length of head. Soft dorsal, anal, and ventrals much produced, ending in a filament. Pectoral $\frac{2}{3}$ length of head. Caudal fin scaled, with deep crescentic emargination. Caudal peduncle nearly twice as long as deep. Scales finely denticulate. Blue or greenish blue, darker above; dorsal and anal fins edged with orange, the former and the caudal with small round brown spots edged with red.

A single specimen, measuring 255 mm.

Paratilapia esox.

D. XVIII-XIX 12-13. A. III 10-11. Sc. 43-45 $\frac{5-6}{12-13}$.

L. l. $\frac{24-27}{16-22}$.

Depth of body $4\frac{1}{2}$ to $5\frac{1}{2}$ times in total length, length of

head 3 times. Head strongly compressed; eye 7 to 8 times in length of head, $3\frac{1}{2}$ to 4 times in length of snout; maxillary widely separated from vertical of anterior border of eye; chin projecting; teeth in two series, few, outer large and widely spaced; 5 or 6 series of scales on the cheek; 15 or 16 gill-rakers on lower part of anterior arch. Dorsal spines weak, increasing in length to the last, which measures $\frac{1}{8}$ length of head. Pectoral $\frac{1}{8}$ length of head. Caudal fin distinctly emarginate, greater part scaled. Caudal peduncle 2 to $2\frac{1}{2}$ times as long as deep. Scales finely denticulate. Bright silvery white, except on the base, which is dark green; fins bluish grey, dorsal and anal edged with orange.

Total length 370 mm. Three specimens.

Allied to *P. longiceps*, Gthr.

Haplochromis venustus.

D. XVI 10-11. A. III 10. Sc. 32-35 $\frac{4-5}{14-16}$. L. I. $\frac{19-23}{15-16}$.

Depth of body $2\frac{1}{2}$ to $2\frac{3}{4}$ times in total length, length of head 3 times. Eye 4 to $4\frac{1}{2}$ times in length of head, about twice in length of snout; maxillary extending to between nostril and eye; lower jaw not projecting; teeth in 4 to 6 series, outer largest, all conical or some of the outer bicuspid; 3 or 4 series of scales on the cheek; 11 or 12 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures $\frac{1}{8}$ or a little less than $\frac{1}{8}$ length of head. Soft dorsal, anal, and ventrals prolonged, acutely pointed. Pectoral as long as head. Caudal fin truncate or slightly emarginate, scaled. Caudal peduncle a little longer than deep. Scales finely denticulate. Peacock-blue, with large deep-blue spots, dotted with red; top of head and a broad edge to the fins orange.

Total length 195 mm. Five specimens.

Closely allied to *H. livingstonii* (*Hemichromis livingstonii*, Gthr.).

Tilapia auromarginata.

D. XVII-XVIII 11. A. III 10. Sc. 33-35 $\frac{4}{13-15}$.
L. I. $\frac{18-24}{15-17}$.

Depth of body $2\frac{1}{2}$ times in total length, length of head $3\frac{1}{2}$ to $3\frac{1}{2}$ times. Eye $3\frac{1}{2}$ to 4 times in length of head, $1\frac{1}{2}$ to $1\frac{1}{2}$ times in length of snout; maxillary extending to between nostril and eye; lower jaw not projecting; teeth small, in 4

or 5 series; 3 or 4 series of scales on the cheek; 15 or 16 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures a little less than $\frac{1}{2}$ length of head. Pectoral as long as head. Caudal fin densely scaled, distinctly emarginate. Caudal peduncle $1\frac{1}{4}$ to $1\frac{1}{3}$ times as long as deep. Scales cycloid or very finely denticulate. Dark blue above, bluish white beneath; dorsal and caudal with small round red spots; dorsal and anal edged with bright yellow.

Three specimens, measuring 200–240 mm.

Closely allied to *T. lateristriga*, Gthr.

Tilapia inornata.

D. XVI-XVII 11-12. A. III 9. Sc. 34-36 $\frac{34-4}{11-12}$.

L. l. $\frac{25-28}{18-18}$.

Depth of body equal to length of head, $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length. Eye $2\frac{1}{2}$ to 3 times in length of head, as long as or longer than snout; maxillary extending to between nostril and eye; lower jaw not projecting; teeth very small, in 3 series; 2 or 3 series of scales on the cheek; 15 or 16 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures a little less than $\frac{1}{2}$ length of head. Pectoral as long as head. Caudal fin with crescentic emargination. Caudal peduncle $1\frac{1}{3}$ times as long as deep. Scales finely denticulate. Silvery, back olive.

Total length 95 mm. Two specimens.

Allied to *T. kirkii*, Gthr.

Tilapia macrophtalma.

D. XV-XVII 10-11. A. III 8-9. Sc. 32-34 $\frac{3}{12}$.

L. l. $\frac{23-29}{18-17}$.

Depth of body equal to length of head, 3 times in total length. Eye $2\frac{1}{2}$ times in length of head; snout with very convex upper outline, $\frac{2}{3}$ diameter of eye; maxillary extending to between nostril and eye; lower jaw not projecting; teeth very small, in 2 series; 2 or 3 series of scales on the cheek; 11 or 12 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures about $\frac{1}{2}$ length of head. Pectoral a little longer than head. Caudal fin with crescentic emargination. Caudal peduncle

$1\frac{1}{2}$ to $1\frac{1}{4}$ times as long as deep. Scales finely denticulate. Brownish above, silvery white beneath, uniform or with very indistinct numerous darker vertical bars; spinous dorsal with a dark and light edge.

Total length 80 mm. Six specimens.

Allied to *T. johnstonii*, Gthr.

Tilapia brevis.

D. XV 12. A. III 9. Sc. 31-32 $\frac{3}{12}$. L. l. $\frac{22-25}{16-17}$.

Depth of body $2\frac{1}{2}$ times in total length, length of head $2\frac{2}{3}$ times. Eye $2\frac{1}{2}$ times in length of head; snout with very convex upper outline, $\frac{2}{3}$ diameter of eye; maxillary extending to below anterior border of eye; lower jaw not projecting; teeth very small, in 2 or 3 series; 3 series of scales on the cheek; 8 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures about $\frac{1}{2}$ length of head. Pectoral as long as head. Caudal fin with crescentic emargination. Caudal peduncle as long as deep. Scales finely denticulate. Silvery, back brownish; a dark brown band on each side, from the nape to the root of the tail; a dark brown opercular spot.

Total length 70 mm. Two specimens.

Allied to *T. johnstonii*, Gthr.

CHILOTILAPIA, gen. nov.

Teeth in several rows, with obtuse or rounded crowns; maxillary exposed; lips thick. 3 anal spines.

Chilotilapia rhoadesii.

D. XV 10. A. III 9. Sc. 34 $\frac{4}{13}$. L. l. $\frac{21}{16}$.

Depth of body $2\frac{1}{2}$ times in total length, length of head 3 times. Snout short, upper profile descending abruptly; eye $4\frac{1}{2}$ times in length of head; maxillary extending to below nostril and eye; teeth in 5 irregular series, outer largest; 4 series of scales on the cheek; 11 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which is a little less than $\frac{1}{2}$ length of head. Pectoral as long as head. Caudal fin densely scaled, feebly emarginate. Caudal peduncle $1\frac{1}{2}$ times as long as deep. Scales finely denticulate. Dark blue; dorsal and anal fins broadly edged with orange.

Total length 220 mm. A single specimen.

XXVII.—*Description of a new Snake from Yunnan.*
By G. A. BOULENGER, F.R.S.

Tropidonotus johannis.

Eye rather small. Rostral not quite twice as broad as deep, just visible from above; internasals as long as broad, nearly as long as the prefrontals, much narrowed in front; frontal once and one-third to once and a half as long as broad, as long as its distance from the end of the snout, much shorter than the parietals; loreal as long as deep or a little longer than deep; one or two pre- and three or four postoculars; temporals $2+1$ or $2+2$; eight upper labials, third, fourth, and fifth entering the eye; four or five lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 19 rows, dorsals feebly or faintly keeled, laterals smooth. Ventrals 165–170; anal divided; subcaudals 85–89. Olive-brown above, with more or less distinct darker and lighter spots, the latter forming a lateral series or an ill-defined lateral streak; a curved yellowish streak may be present on each side of the nape; sutures between the labials blackish; ventrals and subcaudals yellow, with the ends olive-grey and bearing large black spots forming a lateral series.

Total length 910 mm.; tail 210.

Three specimens from Yunnan fu, received from the Rev. John Graham.

Allied to *T. modestus*, Gthr., and *T. pleurotaenia*, Blgr.

The three species may be distinguished by the following characters:—

	Upper labials.	Ventrals.	Subcaudals.
<i>T. modestus</i>	9	154–168	96–122
<i>T. johannis</i>	8	165–170	85–89
<i>T. pleurotaenia</i>	8	148	68

XXVIII.—*On some new Species and Subspecies of Birds from Upper Burma.* By Major H. H. HARINGTON.

DURING two months' leave spent in making a collecting-trip in the Bhamo Hills, N.E. Burma, I was fortunate enough to procure examples of many rare birds and their eggs, including some Chinese species, which had not previously been

recorded from Burma. Amongst these are two apparently new subspecies of Wren (*Urocichla*) ; a *Stachyrhodopsis*, which differs from the Chinese form *S. sinensis* (Grant) in having a longer stouter bill; and an apparently new Flycatcher (*Cyornis*).

My thanks are due to Dr. Bowdler Sharpe and Mr. W. Ogilvie-Grant, who have kindly assisted me in the identification of my specimens, and to the latter for assisting me in describing the following species, the types of which I have presented to the British Museum (Natural History).

Stachyrhodopsis bhamoensis, sp. n.

Adult male. Resembles *S. sinensis*, Grant, in having the light chestnut on the head confined to the crown and not extending over the nape, but may be easily recognized by its much larger and more massive bill. It differs in having faint black shaft-streaks to the feathers of the forehead, the throat less yellow, much the same colour as the breast, which is a dull greyish-olive, and the sides of the head and neck grey instead of yellowish.

Total length about 4·6 inches; exposed part of culmen 0·5; wing 2·1; tail 2·2; tarsus 0·8.

Adult female. Similar to the male.

Hab. Sinlum-kaba, Bhamo District, Upper Burma.

Fairly common; ten specimens were procured.

Cyornis whitei, sp. n.

Adult male. Most nearly allied to *C. tickelliae* (Blyth), but the general colour of the upperparts, including the wings and tail, is more of a turquoise-grey-blue, and the feathers forming the band across the forehead and the superciliary stripes, as well as the least wing-coverts, are pale turquoise-blue; the cheeks and sides of the face are slaty black, without any trace of the blue wash which is so conspicuous in *C. tickelliae*.

Total length about 5·2 inches; culmen 0·45; wing 2·8; tail 2·4; tarsus 0·7.

Female (?). Two females, presumably of this species, resemble those of *C. rubeculoides* (Vigors). One, however, differs in having the right-hand middle tail-feather pale turquoise-blue, like that of the male: there can be no doubt that the sex of this bird was correctly ascertained, for it was captured on its nest and, owing to its blue tail-feather, carefully examined.

Total length about 5·1 inches; culmen 0·45; wing 2·7; tail 2·4; tarsus 0·65.

Hab. Male, Watan, Bhaino District, 3rd April; female (with blue tail-feather), Sinlum-kaba, Bhamo District, 27th April; second female, Mongwai, Bhamo District, 12th April.

I propose calling this beautiful bird after Sir Herbert Thirkell White, Lieutenant-Governor of Burma.

Urocichla kauriensis, sp. n.

Adult male. Very like *U. reptata* (Bingham), but the chest and sides of the breast are of a more rufous-brown, and the middle of breast and belly is distinctly spotted with white.

Total length about 3·7 inches; culmen 0·5; wing 1·8; tail 1·2; tarsus 0·75.

Iris dark red; bill dark horn-colour; legs light brown.

Adult female. Similar to the male, but with the wings less rufous and of a more olive-brown.

Hab. Watan, Bhamo District, Upper Burma.

The above-mentioned specimens were a pair and were shot whilst building their nest.

Urocichla sinlumensis, sp. n.

Adult male. Easily distinguishable from *U. reptata*, Bingham, and the above species (*U. kauriensis*) by having the chin and throat mostly white, slightly mottled with brownish; the feathers of chest, sides of the breast, and flanks of a more olive colour, conspicuously spotted with white and tipped with black.

Total length about 4·1 inches; culmen 0·45; wing 1·9; tail 1·9; tarsus 0·75.

Iris reddish-brown; bill black; legs brownish.

Hab. Sinlum-kaba, Bhamo District, Upper Burma.

Fairly plentiful in the dense undergrowth near water.

XXIX.—*Notes on the Forficulæ.*—XIII. *A Revision of the Brachylabidæ (Isolabidæ).* By MALCOLM BURR, B.A., F.E.S., F.L.S., F.Z.S., F.G.S.

DOHRN (Stett. ent. Zeit. xxv. p. 292, 1864) proposed this genus for the following species:—*mauritanica*, Lucas; *mari-tima*, Bon.; *angulifera*, Gerst.; *chilensis*, Blanch.; and *modesta*, Géné—distinguishing it from *Forcinella* (= *Anisolabis*) by the presence of lateral tubercles on the second and

third abdominal segments. This character is insufficient to justify the separation of a genus, and accordingly Scudder (Proc. Bost. Soc. N. H. xviii. p. 290, 1876) sank *Brachylabis*, as *maritima* is the type of *Forcinella* (= *Anisolabis*), from which *mauritanica* cannot be generically separated. But Scudder had not seen *chilensis*, Blanch., or he would have at once recognized its difference from *maritima*, though he knew and described under the genus *Cylindrogaster* the species *nigra*, which is now known to be a true *Brachylabis*. In 1883 de Bormans (Ann. Soc. ent. Belg. xxvii. p. 64) separated *Brachylabis*, Dohrn, for *chilensis*, which he made the type, and *punctata*, Dubr. Verhoeff did not know any of the six described species of *Brachylabis* when he erected his family Isolabidæ for his three genera *Isolabis*, *Ctenisolabis*, and *Leptisolabis*, all from the Ethiopian Region (SB. Ges. naturf. Fr. Berlin, 1901, no. 1, p. 10); but three years later (Arch. f. Naturg. 1904, Bd. i. p. 119) he noted the resemblance between the Isolabidæ and *Brachylabis*, though he had not seen a single specimen of the latter. He doubted the inclusion of *B. chilensis* in the Isolabidæ, but suggested that *B. bisevoelata* was a true Isolabid.

A comparison of the generic characters shows that the two genera are evidently allied, and a glance at the types in Berlin removed all remaining doubt.

It now became necessary to examine the different species of *Brachylabis* to see if it were possible to reorganize the system and allocate the various species to the different genera.

Fortunately I possess in my collection the following species:—*chilensis*, Blanch., *nigra*, Scudder, *malgacha*, Burr, *punctata*, Dubr., from Java, as well as *punctata*, Bormans, from Burmah, which is a distinct form.

By using Verhoeff's arrangement of the Isolabidæ, it was possible to allocate all these species to what appears to be their true position; thus the riddle of the Isolabidæ, which has puzzled dermapterists since 1902, is solved.

Table of Subfamilies and Genera.

1. Segmentum ultimum dorsale & marginem postico medio exciso, utrinque lobulo triangulari instructum; corpus fere cylindricum.....	BRACHYLABINÆ.
2. Mesonotum elytris rudimentariis instructum	1. <i>Verhoeffia</i> , g. n.
2.2. Mesonotum elytris rudimentariis nullis.	
3. Mesonotum lateribus carinatis	2. <i>Brachylabis</i> , Dohrn
3.3. Mesonotum lateribus integris, interdum tumido-elevatis.	[(= <i>Ctenisolabis</i> , Verh.).]

4. Antennarum segmento 3 elongato, duplo longiori quam latiori	3. <i>Isolabis</i> , Verh.
4.4. Antennarum segmento 3 globulari.	4. <i>Leptisolabis</i> , Verh.
1.1. Segmentum ultimum dorsale ♂ marginē postico integro, truncato; corpus plus minus depresso	PARISOLABINÆ.
2. Abdomen ♂ ♀ fortius dilatatum; seg- mentum ultimum dorsale ♂ valde angustatum	5. <i>Parisolabis</i> , Verh.
2.2. Abdomen ♂ vix dilatatum; segmen- tum ultimum dorsale ♂ haud angus- tatum, transversum	6. <i>Pseudisolabis</i> , g. n.

Subfamily I. *BRACHYLABINÆ*.

The genus *Isolabis*, Verh., falling into the same subfamily as *Brachylabis*, Dohrn, it is necessary to suppress the name *Isolabinae* for the subfamily and to substitute that of *Brachylabinae*.

In the cylindrical form of the body, the few antennal segments, the triangular head, large eyes, attenuated abdomen, excised last dorsal segment, and tapering, slender, arched forceps, it is very well characterized. All the members have a very distinctive appearance and cannot be confused with any other group.

Genus I. VERHOEFFIA, nov.

*Antennæ segmento 3 longo, saltem duplo longiori quam latiori, 4
longiori quam latiori, 5 tertium longitudine subæquanti; meso-
notum lateribus haud carinatis, ad humeros ipsos obtuse tumido-
elevatis, elytris rudimentariis instructum, cæteris cum generibus
Isolabide et *Brachylabide* congruet.*

As Verhoeff, in characterizing the *Isolabidæ*, says "Elytra und Flügel fehlen völlig," I erect this new genus for *Brachylabis sjöstedti*, Borg (Ark. f. Zool. i. p. 568, Taf. xxvi. fig. 2, 1904), from the Cameroons. Borg gives a good figure, and the rudimentary elytra are plainly shown like a Y-shaped suture on the mesonotum. Their form somewhat recalls that of the same organs in *Karschiella*, in which the chief sign of elytra is a narrow excision in the posterior border of the mesonotum. My friend Dr. Borelli, of Turin, has sent me a specimen from Fernando Po, and I have in my own collection one labelled "Cameroon."

Genus II. BRACHYLABIS, Dohrn (sensu stricto).

Brachylabis, Dohrn (part.), Stett. ent. Zeit. xxv. p. 292 (1864); Borm. Ann. Soc. ent. Belg. xxvii. p. 64 (1883); Kirby, Journ. Linn. Soc., Zool. xxiii. p. 518 (1891); id. Cat. Orth. i. p. 18 (1904).
Ctenisolabis, Verhoeff, SB. Ges. nat. Fr. Berlin, 1902, p. 11.

Mesonotum with distinct sharp lateral keel on each side. Third antennal segment a little longer than broad.

The above characters, by which Verhoeff distinguishes his genus *Ctenisolabis*, for the single species *Ct. togoensis*, are common to *B. chilensis*, Blanch., which is the type of *Brachylabis*. Consequently the former genus falls as a synonym.

Brachylabis in its true sense also includes *B. nigra*, Scudd., *B. malgacha*, Burr., *B. caudelli*, sp. n. (*vide infra*), *B. bifoveolata*, Bol., and *B. voeltzkowi*, sp. n. (*vide infra*).

1. Pronotum longius quam latius. (Antennarum segmentum 3 quam 2 duplo longius.)
2. Mesonotum carinis obtusis usque ad marginem posticum productis; (pedibus infuscatis: species madecassa)
- 2.2. Mesonotum carinis acutis ante marginem posticum evanescentibus.
3. Statura gracili; genubus flavis: species madecassa
- 3.3. Statura fortiori; genubus infuscatis: species americana meridionalis
- 1.1. Pronotum vix longius quam latius.
2. Antennarum segmentum 3 vix longius quam latius.
3. Frons punctis impressis postice confluentibus: species africana
- 3.3. Frons punctis impressis haud confluentibus: species peruviana
- 2.2. Antennarum segmentum 3 duplo longius quam latius: species asiatica.
3. Pedibus unicoloribus; abdomen segmentum 4 pliciferum
- 3.3. Pedibus fulvo-annulatis; abdomen segmentis 3 et 4 pliciferis.....

1. *malyucha*, Burr.
2. *voeltzkowi*, sp. n.
3. *chilensis*, Blanch.
4. *togoensis*, Verh.
5. *nigra*, Scudd.
6. *bifoveolata*, Bol.
7. *caudelli*, sp. n.

1. *Brachylabis malgacha*, Burr.

Brachylabis malgacha, Burr., Trans. Ent. Soc. London, 1904, p. 292.

This species has a distinctive appearance; the feet are slenderer and longer than in the other species, the antennæ are not so thick, and the keel of the mesonotum is more obtuse. It is recorded from Madagascar and Diego Suarez.

2. *Brachylabis voeltzkowi*, sp. n.

Statura minori, graciliori; antennæ 15 segmentis, apice fulvo-annulatae; pronotum valde longius quam latius; mesonotum carinis acutis, paullo ante marginem posticum evanescentibus; femora tibiæque fusca, apice fulvo-annulata. ♂.

Long. corporis.....	11 mm.
" forcipis	1 "

Stature small and rather slender. Antennæ with 15 segments: the twelfth is yellow in the type specimen, the rest black; the third segment is quite twice as long as broad, the fourth shorter: the head is small and quite typical.

Pronotum about $1\frac{1}{2}$ times as long as broad, slightly broader posteriorly than anteriorly; median suture almost obsolete.

Mesonotum with lateral keels sharp, gently curved, obsolete just before reaching the posterior margin.

Metanotum strongly sinuate posteriorly. Femora and tibiæ black, each with a yellow ring at the apex.

Abdomen slender, with distinct lateral tubercle on the fourth segment only; last dorsal segment typical, excavate, and attenuate.

Forceps with branches remote at the base, cylindrical, gently incurved, and crossing at the apex.

Nossi-Bé (*Voeltzkow*).

The single male specimen which is my type is out of de Bormans's collection, and was labelled by him "*Brachylabis punctata*, Dubr." It differs, of course, from the true *punctata* in the generic characters, but has a strong resemblance to *Br. caudelli* from Burmah, which de Bormans confused with *B. punctata*. It differs from *B. caudelli* in the longer and narrower pronotum and in the evanescence of the mesothoracic keels.

3. *Brachylabis chilensis*, Blanch.

The literature of this species is quoted by de Bormans and Kirby. It is the largest of the genus and quite different in appearance from *B. nigra*, the only other known American species. It occurs in Chili, Ecuador, and Brazil, but does not seem to be common.

4. *Brachylabis togoensis*, Verh.

Ctenisolabis togoensis, Verh. SB. Ges. nat. Fr. Berlin, 1902, p. 14.

This species is only known to me by Verhoeff's description and a sketch of the type. It is one of the smaller species and appears to be allied to *B. nigra*.

5. *Brachylabis nigra*, Scudd.

Originally described as a *Cylindrogaster*, this is a true *Brachylabis*. It is easy to recognize, as it is stouter and smaller than the only other known American species, *B. chilensis*, and has a characteristic greenish sheen; but this is not always preserved in cabinet specimens.

It occurs in northern South America.

6. *Brachylabis bifoveolata*, Bol.

Brachylabis bifoveolata, Bol. Ann. Soc. Ent. Fr. 1897, p. 285, pl. x. fig. 1.

Bolivar's description is brief but good, and so is his figure. It differs from *B. caudelli*, the other Asiatic species, in its uniform reddish legs, in the more strongly convergent keels of the mesonotum, and in the absence of the glandular folds in the third abdominal segment.

7. *Brachylabis caudelli*, sp. n.

Antennæ nigræ, ante apicem pallido-annulatæ, segmento 3 duplo longius quam latius, 5 quam 3 æque longo, fere cylindricis; pronotum subquadratum, haud vel vix longius quam latius; mesonotum carinis acutis leviter arcuatis; femora basi nigra, apice pallida; tibiæ fuscæ, apice pallidiores; forcipis brachia ♂ basi haud contigua. ♂ ♀.

	♂.	♀.
Long. corporis	11 mm.	12 mm.
,, forcipis	1·5 „	1 „

Small; colour, texture, form, and pubescence typical; antennæ with 15 segments, with a pale ring before the apex; segments rather long, third is about twice as long as broad, fourth more than half as long as third, fifth quite as long as third, if not a trifle longer; body almost cylindrical; mesonotum with the keels gently bowed at the shoulder and gently converging posteriorly; femora black, yellow at the apex; tibiæ brownish yellow, paler towards the apex; tarsi paler; abdomen typical, third and fourth segments with strong lateral tubercles; forceps stout at the base, not contiguous in the male, contiguous in the female, rapidly tapering, gently arched.

Burma, Tenasserim, and Pegu (*Borm.*).

Apparently common in Further India. This species was confused by de Bormans with *B. punctata*, which is now proved to be generically distinct; but there is, of course, a strong family likeness throughout the Brachylabidæ. It is most like *B. voeltzkowi* in appearance.

8. ? *Brachylabis geniculata*, Montr.

Chelidura geniculata, Montrousier, Ann. Soc. L. Lyon, (n. s.) xi. p. 222 (1864).

Brachylabis geniculata, Borm. Tierreich, Forf. p. 54 (1900).

Montrousier's description is insufficient, but de Bormans

gives a description, with an enquiry as to the sex. I have a coloured sketch of a female by de Bormans which shows distinct *straight* keels on the mesonotum, so it must apparently be referred to this genus. From this sketch it appears that the third antennal segment is decidedly long.

It may be provisionally ranged in *Brachylabis*.

Genus III. ISOLABIS, Verh.

Isolabis, Verhoeff, SB. Ges. naturf. Fr. Berlin, 1902, p. 14.

In this genus there are no keels on the mesonotum, though the sides are somewhat tumid; it thus differs from *Brachylabis*.

It differs from *Leptisolabis* in having the third antennal segment double as long as broad. The forceps ♂ are remote at the base.

It contains at present a single species, *I. braueri*, Verh., from Africa, which is only known to me from the description and a sketch of the type.

Genus IV. LEPTISOLABIS, Verh.

Leptisolabis, Verh. SB. Ges. naturf. Fr. Berlin, p. 12 (1902).

Brachylabis, Borm. (partim).

This genus agrees with *Isolabis* in having no keels to the mesonotum, but differs in having the third segment of the antennæ very short, only as long as broad. According to Verhoeff, the two African species have the head on a slim neck; but I consider this an individual peculiarity dependent on the position assumed by the organs on drying and analogous to, and as valueless as, the crossing of the forceps at the apex, which is as purely fortuitous as the position assumed by the antennæ or legs. The branches of the forceps are near together at the base. In all known species the antennæ are ringed with white and the femora and tibiæ with yellow.

Table of Species.

1. Pronotum parallelum	1. <i>philetas</i> , Burr.
1.1. Pronotum postice dilatatum.	
2. Pronotum anteriori margine truncato:	
species javana.....	2. <i>punctata</i> , Dubr.
2.2. Margo anterior pronoti in collum brevem productus: species africanæ.	
3. Metanotum paullo excavatum	3. <i>usambarana</i> , Verh.
3.8. Metanotum fortiter excavatum	4. <i>theovite</i> , Verh.

1. *Leptisolabis philetas*, Burr.

Brachylabis philetas, Burr, J. Bombay N. H. Soc. xiv. p. 322, pl. B. fig. 7 (1902).

The description and figure render this little species unmistakable; the transverse depression on the mesonotum is very characteristic.

2. *Leptisolabis punctata*, Dubr.

Brachylabis punctata, Dubr. Ann. Mus. Civ. Gen. xiv. p. 357, fig., ♀ (1879); id. Tierreich, Forf. p. 53 (1900) (partim); *neotype* Born. Ann. Mus. Civ. Gen. (2) vi. p. 436 (1888) & loc. cit. xvi. p. 379 (1894).

If we exclude the Burmese specimen taken by Fea, de Bormans's remarks and notes apply to this species. It is quite different from *B. philetas*, but it is impossible to discriminate it accurately from the African species of Verhoeff without a comparison of authentic specimens.

3. *Leptisolabis usamburana*, Verh., and

4. *L. theoriae*, Verh.

Verhoeff suggests that the latter is a subspecies of the former, which is very probable. Both are from German East Africa, but it is unsatisfactory to discuss the species without an examination of the type.

Subfamily II. *PARIISOLABINÆ* (Verh. Arch. f. Naturg. 1904, p. 119).

~~aff~~ separates this subfamily from the Isolabinae by ~~the presence of~~, which is thus distinct from the rest of the head, without lines, but with the two impressed points. The eyes are only moderately large, separated from the posterior margin of the head by their own diameter; abdomen with a lateral tubercle; second tarsal segment half as long as the third. Forceps of the male remote; tenth abdominal segment truncate at the posterior margin.

Genus V. *PARIISOLABIS*, Verh.

This genus is monotypic, the only known species being *Parisolabis nove-zeelandiae*, Verh. (op. cit. p. 120).

Commander Walker has given me a male from New Zealand which I attributed provisionally to this species, but a glance at Verhoeff's types, on the occasion of a flying visit to the Berlin Museum, showed me that they are "not like

mine, brown, flat, and broad," in the words of my rough notes taken on the occasion. My specimen is black, not very flat, and by no means broad. On carefully comparing it with Verhoeff's characterization of *Parisolabis*, I find that it differs in important particulars, and accordingly am obliged to erect a new genus.

Genus VI. PSEUDISOLABIS, gen. nov.

Corpus minute punctulatum, valde pubescens; pars antica corporis fere cylindrica; abdomen sat depresso: antennæ 15 segmentis, 3 cylindrico, duplo longiori quam latiori; 4 et 5 brevibus, globularibus; cæteris cylindricis, sat brevibus: caput minus triangulare; pronotum sublatius quam longius; mesonotum carinis nullis: pedes graciles; tarsi longi, segmento 2 elongato: abdomen sat depresso, ante apicem subdilatatum, tuberculis lateralibus nullis, segmentis apicalibus lateribus convexis; segmento ultimo dorsali transverso, haud angustato, margine postico truncato: forcipis bracchia basi remota, basi ipso triquetra, deinde cylindrica, angusta. ♂.

The whole body is finely punctulate and covered with a close yellowish pubescence.

Antennæ with 15 segments, the first long, strongly clavate; second minute, cylindrical; third cylindrical, long, but not so long as the first; fourth minute and globular, not longer than broad; fifth longer than fourth, a little longer than broad; the rest gradually lengthening, but none equalling the third in length, rather thick, cylindrical, but the joints distinctly constricted.

Head not sharply triangular, rectangular posteriorly; the occiput punctulate and pubescent; the frons smooth and tumid; the frontal impressions obsolete. Pronotum subquadrate, the anterior and posterior margins parallel and truncate, slightly broader posteriorly than anteriorly and broader than long, a trifle broader than the head; sides straight, gently diverging posteriorly.

Mesonotum transverse, parallel, with no keels.

Metanotum broader than the mesonotum, the posterior margin gently sinuate.

Prosternum about double as long as broad, parallel.

Mesosternum transverse, posterior margin truncate.

Metasternum transverse, the posterior margin truncate.

Femora rather thick, especially the anterior pair; tibiae and tarsi slender, second segment of latter rather long and slender, about half as long as the third, the first about as long as the second and third united.

Abdomen rather depressed, gently dilated about the apical

third and very slightly narrower at the apex itself; last dorsal segment short, transverse, truncate posteriorly; penultimate ventral segment obtusely rounded; last ventral segment visible as a pair of triangular lobes just protruding.

Forceps remote at the base, triquetre at the base itself, arcuate, tapering and short, ♂; ♀ unknown.

This genus differs from *Parisolabis* in being much less depressed and less dilated, and the last dorsal segment is by no means narrowed.

It approaches more nearly to *Anisolabis* than does *Parisolabis*, and represents the transition between the Brachylabidæ and the Anisolabidæ.

In the form of the abdomen and last dorsal segment *Pseudisolabis* approaches *Anisolabis*, but the antennæ have fewer segments, the second segment of the tarsi is longer, the posterior margin of the metasternum is scarcely produced between the posterior coxae, and the mesosternum is shorter, relatively much broader, and truncate posteriorly.

1. *Pseudisolabis walkeri*, sp. n.

Statura mediocri: rufo-niger; femoribus fulvo-nigris, tibiis tarsisque nigris: forcipis bracchia basi valde remota, in tertia parte basali triquetra, sat valida, sensim divergentia; dein subito incurva, cylindrica, recta, attenuata. ♂.

Long. corporis	11·5 mm.	♂.
" forcipis	2 "	

Of medium size; deep reddish black; femora yellowish black, the tibiæ and tarsi darker. Forceps triquetre and gently diverging in the basal third, then rather abruptly bent inwards, straight, cylindrical, tapering, and converging. ♂.

New Zealand, Te Aroha, January 1902.

This interesting specimen was taken by Commander J. J. Walker, R.N., M.A., F.E.S., who kindly gave it to me, and I have the pleasure of dedicating it to him.

XXX.—Descriptions of new African Heterocera.

By GEORGE T. BETHUNE-BAKER, F.L.S., F.Z.S.

My measurements are taken by doubling the distance from the centre of the thorax to the apex of the wing.

Eupterotidæ.

PARADRALLIA, gen. nov.

Palpi minute, hairy. Neuration: primaries with vein 2 from

a third below the lower angle, 3 and 4 from the angle, 5 from directly above the middle of the cell; 6, 7, 8, and 9 stalked; 6 from close to the angle; 8 close to the apex, ending in the apex; 9 from near the middle of 7; 10 absent; 11 from the cell near the upper angle and lying just above 9; 12 long, three-quarters the length of the costa. Secondaries: vein 2 from about a third from the lower angle, 3 and 4 on a very short stalk from the angle, 5 from above the middle of the cell, 6 and 7 on a long stalk. Wings: primaries rapidly expanding, subtriangular; costa nearly straight, slightly depressed at apex; termen slightly arched: secondaries with costa nearly straight; termen moderately arched, fullest between veins 3 and 4.

Type, *Paradrallia rhodesi*, B.-B.

Paradrallia rhodesi, sp. n.

♂. Palpi and head deep ochreous; thorax pale straw-colour; abdomen deep ochreous. Both wings pale straw-colour: primaries paler than the secondaries, and with a black dot in the middle of the discocellulars, preceded by a small orange spot in the cell and followed by a similar small spot just outside the cell; two orange spots in the fold placed horizontally below the angle of vein 2: secondaries spotless.

Expanse 34 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

Notodontidae.

Dinara acholi, sp. n.

♀. Palpi smoke-brown; head and thorax pale buff; patagia pinkish grey, edged on the shoulder by pale fawn-colour; abdomen orange-brown, with anal segments pale ochreous grey; legs and breast smoky grey. Primaries below the cell and vein 2 pale ochreous grey, yellowish in the fold, cell and beyond below vein 6 pale pinkish brown, with two long, very narrow, scimitar-shaped streaks, palely edged, in the cell; cell closed by a short scalloped dash palely edged; costa brownish, streaked narrowly with ochreous between the veins; area between veins 6 and 9 pale ochreous, with veins darkly outlined; termen with dark scallops finely edged with ochreous: secondaries dark greyish, slightly ochreous at extreme base.

Expanse 64 mm.

Hab. Patigo, Acholi Country.

Type in my collection.

Osica verulama, sp. n.

♂. Head, thorax, and primaries dirty chocolate-brown; abdomen yellowish. Primaries with the veins slightly darker than the ground-colour, cell closed by a dark fine curved dash; posterior line fine, dark-edged externally, finely somewhat palely, strongly crenulate, followed by an internervular row of dashes more or less crescentic in shape; termen scalloped, finely dark: secondaries uniform spotless yellowish cream-colour.

Expanse 48 mm.

Hab. Verulam, Natal.

Type in my collection.

*Limacodidæ.**Thosea catori*, sp. n.

♂. Head, thorax, and abdomen dull brownish. Primaries dull madder-brown, with a pale slightly excurred postmedian line, darkly and finely edged internally; beyond this the area is paler; with a fine dark excurred subterminal line; the whole surface is finely speckled with pale grey, caused by largish superimposed scales which are pale grey with dark tips: secondaries uniform pale brownish.

Expanse 22 mm.

Hab. Northern Nigeria (above Lokoja).

Type in my collection.

Parasa smaragdina, sp. n.

♂. Palpi deep cream-colour, laterally with a rusty patch; head greenish; antennæ pale brown; thorax bright green; abdomen yellowish. Primary with basal and terminal areas pale brown, all the rest of the wing bright greenish, invading the terminal brown in two deep curves from vein 1 to 3 and from below 5 to 7, and again in a lesser curve on the costa; fringes pale brown, intersected finely with dark brown at the veins, and outer half darker also: secondaries pale clear straw-colour, with a very defined narrow terminal darker band of the ground-colour.

Expanse 27 mm.

Hab. Northern Nigeria, Lokoja district.

Type in my collection.

Lasiocampidæ.

Taragama rufaria, sp. n.

♂. Palpi rufous below, with the extremities of hairs tipped with deep yellow, grey above; head and collar grey; antennæ rufous; thorax rufous, with patagia deep rusty red, edged finely with grey; abdomen rufous on the dorsum, ventral surface grey. Primaries dark rufous grey, with a small white basal spot, followed by an oblong spot or broad dash of orange rusty red, intersected near its outer edge by the fine white antemedian line, which line is nearly erect to the cell, where it is interrupted, and is continued at the end of the cell upwards in a slight curve to the costa. In the male this line might be construed into an antemedian and median line on account of the difference of the position of the two parts, but the female insect shows it to be one, very strongly angled outwards. Postmedian line fine, white, strongly angled outwards in the fold to above vein 3, from where it is angled and waved to the costa not far from the apex; a small rusty orange-red patch at the end of the cell, beyond which the wing is dark reddish brown to the postmedian line between vein 3 and the costa; fringes grey. Secondaries uniform rufous brown, with pale grey fringes.

♀. Like the male, but with the abdomen dirty creamy grey, the primaries paler and redder, the white lines more distinct, and a subterminal irregular row of obscure inter nervular red spots just outside white postmedian line: secondaries pale pinkish buff, with an obscure, white, transverse, oblique band.

Expanse, ♂ 42, ♀ 82 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Types in my collection.

Near *T. polydora*, Druce.

Metanastria jamesoni, sp. n.

♂. Palpi very dark purplish brown, nearly blackish; head chocolate-brown; antennæ greyish brown, pectinations very long, tapering gradually to the tip; thorax rich chocolate-brown, with a small cream-coloured very short tuft on the metathorax, so short as to appear little more than a spot; abdomen yellowish cream-colour, the breast and the whole ventral surface chocolate-brown. Primaries rich chocolate-brown, with a somewhat pale, waved, oblique postmedial line, the area on the basal side of this line being much darker than that beyond; a whitish dot in the cell: secondaries

yellowish cream-colour, tinged slightly but very indefinitely with brownish near the outer margin.

♀. Like the male, but much paler, the thorax, ventral surface, and primaries being pale rusty brown instead of rich chocolate; the postmedial line, though obscure as in the male, is broader and bisected, and there is an obscure trace of a subterminal scalloped line in the primaries.

Expanse, ♂ 74, ♀ 101–102 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

This species is near *M. cuneilinea*.

Metanastria denticula, sp. n.

♂. Palpi rusty brown; head and thorax pale fawn-grey; abdomen yellowish brown, ventral surface greyish. Primaries pinkish grey, with a twin median oblique irregular line of black subdenteate marks, sometimes degenerating into black points, the interior being dull grey; a similar oblique, postmedian twin serrated line, the black points being only visible on the internal one of the two lines: secondaries yellowish straw-colour, tinged with pinkish beyond the median area and becoming greyish in the terminal area.

Expanse 66 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

This species is near *M. honrathi*, Dewitz.

Philotherma clara, sp. n.

♂. Head, thorax, and abdomen pale cream-colour. Both wings pale cream-colour, tinged slightly with pinkish: primaries with a fine oblique dark antemedian line, and a dark oblique postmedian line angled basewards just below the costa, these two lines converging towards each other on the inner margin; a trace of a small dark spot in the cell: secondaries markless.

Expanse 79 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

This species is near *P. sordida*, Auriv.

Gonometa druci, sp. n.

♂. Palpi, head, and antennae rufous brown; thorax purplish brown; abdomen pale yellowish brown. Primaries dark purplish brown, somewhat rusty on the veins near the cells;

an obscure scalloped oblique postmedian pale pinkish line to the costa near the apex, followed by a slightly excurved, pale pinkish rusty irregular subterminal stripe, from which to the termen the area is greyish; fringes dark, intercepted somewhat palely at the veins; area below vein 2 darker purplish: secondaries purplish brownish grey, with the basal and median areas below vein 6 whitish.

♀. Just like the male.

Expanse, ♂ 70, ♀ 85 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Types in my collection.

Near *G. sophax*, Druce.

Gonometa pallens, sp. n.

♀. Head and thorax ochreous grey; abdomen ochreous cream-colour. Primary ochreous grey, with a broad waved oblique median band and a broader oblique postmedian band, definite on its interior edge, indefinite and somewhat scalloped on its external edge, very broad at the tornal area, narrower above vein 5; these two bands are nearly the same colour as the wings, but slightly paler and smoother in texture, the other part of the wing having a roughish surface: secondaries yellowish straw-colour.

Expanse 96 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

Lymantridæ.

RHODESANA, gen. nov.

Palpi in male very heavily scaled, smoothly above, but thickly and coarsely below, so as to be somewhat brush-like, and so thick as to almost hide the minute end segment, also thickly scaled; the scaling in the female is less heavy and the second segment proportionately rather longer than in the male. Antennæ with long pectinations, with cilia, and having terminal spines; in the female the pectinations are shorter, antennal socket with a tuft of longish dense hairs below; head roughly scaled; thorax with a thick tuft on the meso- and on the metathorax; abdomen prominently tufted on the three proximal segments; legs in male very densely hairy, less dense in female. Neuration: primaries with vein 2 from just beyond the middle of the cell, 3 before the lower angle, 4 from the lower angle, 5 from above the angle, 6 from the upper angle; 7, 8, 9, and 10 stalked, 9 given off from 10

and anastomosing with 8 to form the areole, 7 from the end of the areole : secondaries with 3 from below the angle, 4 from the angle, 5 from above the angle, 6 and 7 from the upper angle.

Type, *Rhodesana crenulata*, B-B.

Rhodesana crenulata, sp. n.

♂. Head and thorax chestnut-brown ; abdomen fawn-brown, with dark tufts. Primaries sepia-brown, with an antemedian and a median costal patch of greyish and a similar darker patch below the angle of vein 2 ; a rich deep velvety-brown basal line to vein 1a ; a similar-coloured irregular median line to the inner margin, being a double line from the costa to the lower margin of the cell, this line divides the two greyish patches ; reniform very large, paler than ground, more or less darkly edged ; postmedian line dark velvety brown, crenulate, produced outwards between veins 9 and 6 ; a subterminal series of dark red-brown internervular dashes between veins 1, 2, 3, 4, and 7 and 8 ; these dashes are replaced by small spots between veins 4-7, the series is roughly parallel with the crenulate line, and is followed by a sub-terminal fine dark line, interrupted at the veins and rather irregular ; fringes pale fawn-brown, with darker internervular intersections : secondaries creamy grey, becoming brownish in the postmedian and terminal areas.

♀. Like the male in all particulars.

Expanse, ♂ 58, ♀ 74 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Types in my collection.

Lælia aethiopica, sp. n.

♂. Head and thorax ochreous, abdomen paler. Both wings pale ochreous ; primaries with a small orange spot at the upper angle of the end of the cell and a trace of a similar small spot in the fold near its middle. No other marking at all beyond these.

Expanse 30 mm.

Hab. Fort Jameson, N.E. Rhodesia ; Uganda and Nigeria.

Type in my collection ; specimens from Uganda and Nigeria are in the National Collection.

Lælia marginepunctata, sp. n.

♂. Head and thorax ochreous. Primaries pale ochreous, with an obscure trace of an indefinite greyish oblique antemedian band, and a more obscure trace of a similar oblique

postmedian band; a subterminal row of small internervular distinct black spots: secondaries dirty ochreous, clearer towards the termen.

Expanse 36 mm.

Hab. Fort Jameson, N.E. Rhodesia.

Type in my collection.

Arctiidae.

EMINARIA, gen. nov.

Palpi minute, porrect; proboscis rudimentary. Neurulation primaries with vein 2 rising a little beyond the middle of the cell, 3 from the lower angle, 4 and 5 from the same point just above the angle; 6, 7, and 10 from the upper angle; 7, 8, and 9 stalked, 7 bent strongly downwards to the termen, 8 from midway between the cell and the apex, ending in the apex, 9 from near the apex to the costa; 11 from well before the upper angle; 7, 10, and 11 lie closely appressed to each other: secondaries with vein 2 a third from the angle, 3 from the angle, 4 and 5 from just above the angle, 6 and 7 from the upper angle, 8 anastomosing for nearly half the cell.

Type, *Eminaria nigropunctata*, B-B.

Eminaria nigropunctata, sp. n.

♀. Palpi white, with black bases; head and thorax white, collar with two black dots, thorax with two black dots on the patagia; abdomen yellow, with fine black segmental divisions. Primaries white, with a black basal point, followed by a second below the cell, above it a fine black point on the costa, followed by a small black spot midway along the costa and another black point in front of the apex; a small black spot midway along vein 5 and another in the tornus which probably forms one of a terminal series of internervular black spots, the three near the apex being present also: secondaries translucent milky white, with a black point in the middle of the discocellulars and a blackish-grey spot near the termen below vein 2.

Expanse 50 mm.

Hab. Patigo, Acholi Country, 4000 feet.

Type in my collection.

Creatonotus spilleri, sp. n.

♂. Palpi white, banded and tipped with blackish brown; frons white, with four black spots; head white; antennæ brown; thorax white, with two blackish-brown spots on the

collar, one wedge-shaped brown spot on each patagium, one similar wedge-shaped spot between the patagia, one smaller spot in the centre and two on the metathorax ; abdomen yellow, with a spot on the dorsum of the two proximal segments. Primaries white, with a costal brown patch close to the base, with a white spot on the costa, this patch is very irregular ; a large very irregular median patch occupying the median and postmedian areas and enclosing a large white costal patch ; terminal area brown, most irregularly invaded by the white ground, giving it a serrate outline ; this brown area is connected with the postmedian area along vein 5, which gives off two brown short waved dashes below and one above it ; below vein 1^a are three spots, one near the base and two smaller ones nearer the middle : secondaries creamy translucent white, with a black dash closing the cell on the underside showing indistinctly through ; termen pale brown to vein 2.

Expanse 44 mm.

Hab. Verulam, Natal.

Type in my collection.

Near *marginalis*, Walk.

Cossidae.

Azygophleps albovittata, sp. n.

♂. Palpi sooty grey ; frons and antennal tufts yellowish ; vertex, thorax, and abdomen silvery greyish. Primaries pale greyish, strongly and finely reticulated with blackish all over except on the creamy-white expanding stripe occupying the cell, and area beyond to the termen between veins 5 and 8 : secondaries creamy white.

Expanse 36 mm.

Hab. N. Nigeria, Lokoja District ; Ruenzori.

Type in my collection ; other specimens in the National Collection from Mount Ruenzori.

Arbelidae.

CATARBELANA, gen. nov.

Palpi minute, upturned, hairy on first segment ; thorax with patagia erected into slight lateral tufts and a double tuft on the metathorax ; antennæ strongly bipectinate with cilia. Neuration : primaries with cell, between the *Marshalliana* and *Catarbela* type*, i. e. with the lower half of the

* Ent. Tids. 1901, pp. 126-128.

cell much less produced outwards than in the former genus, but decidedly more than in the latter. Vein 2 from a little beyond the middle of the cell, 3 from midway between 2 and the lower angle, 4 from the angle, 5 from just above the angle and so forming a short right angle with the discocellular before receding basewards, 6 from below the upper angle; 7, 8, and 9 stalked, 7 and 8 from about midway between the angle and the termen, 9 from nearer the cell than vein 8; 10 absent; 11 long, from the cell reaching nearly to the apex: secondaries with 1 and 1 a stalked for nearly half the length of 1; lower part of cell and veins 2, 3, 4, 5 as in *Marshalliana*; vein 6 from well below the upper angle, 7 from the upper angle, 8 with a bar to the cell as shown in the figure of the neuration of *Metarbelia umtaliana*, Auriv.*.

Type, *Catarbelana bassa*, B-B.

This genus will come after *Marshalliana*, Auriv., but before *Catarbela*, Auriv.

Catarbelana bassa, sp. n.

♂. Head, thorax, abdomen, and primaries uniform pale brown. Primaries with fine dark reticulations all over the wing, but with two prominent dark lines, viz. the postmedian line and the subterminal, the former slightly excurred for upper portion, but sharply incurved on the fold, the subterminal line being nearly erect for the upper part to vein 3, where it is angled outwards into the tornus about vein 2; a dark basal dash on the inner margin to over a half, rising in a short basal tuft: secondaries uniformly darker brown than the primaries.

Expanse 34 mm.

Hab. N. Nigeria, Lokoja District.

Type in my collection.

XXXI.—*A new Freshwater Polyzoan from S. Africa.*

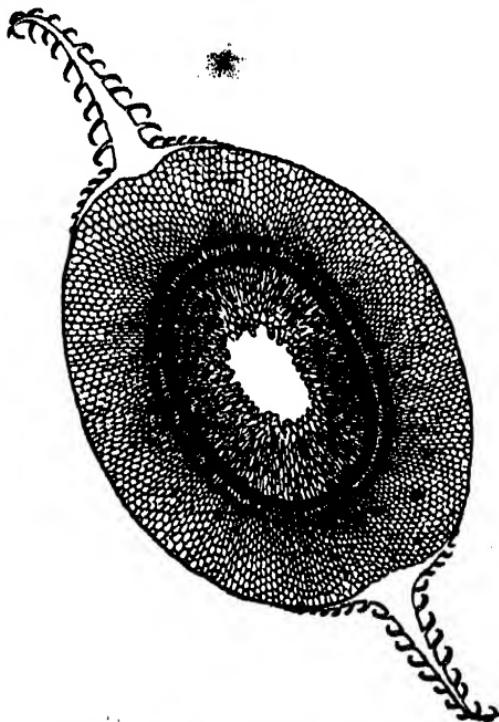
By IGERNA B. J. SOLLAS.

A COLLECTION of freshwater organisms from the Valkenberg Vlei, near Cape Town, was brought to me in October 1907 by Miss Stephens, who tells me that her collection is the first which has been made in that Vlei. Thanks to her care in daily supplying the organisms with fresh water during the

* Ent. Tids. 1901, p. 127.

voyage to England, some of them were still alive when she handed them over to me. The most noteworthy among them was a colony of freshwater Polyzoa attached to a stem of triangular section. It had produced numerous statoblasts, some of which were still contained in the parent colony, while others, and these were the greater number, were free and lay at the bottom of the jar. A long process at each end rendered the appearance of the statoblasts strikingly different from the reproductive bodies of Polyzoa with which I was familiar. I consequently showed them to Dr. Harmer, who recognized them as probably belonging to a new species of *Lophopus* allied to *Lophopus carteri*, Hyatt (= *Lophopodella* sp., Rousset).

Fig. 1.



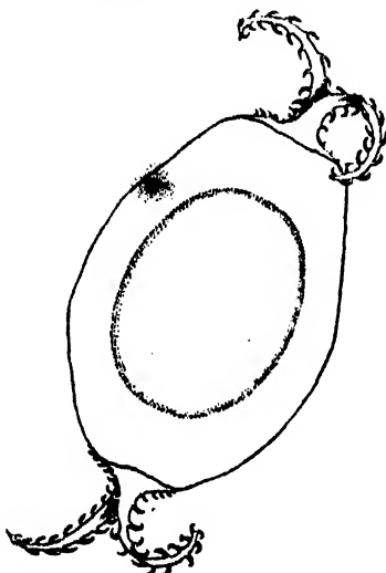
A single valve of a statoblast of *Lophopus capensis*. The artist has not represented the air-cells quite correctly: they have the usual hexagonal form.

Definition.—The new species, which I propose to call *Lophopus capensis*, is referred to the genus *Lophopus* on account of its thick gelatinous ectocyst and of the form of its statoblasts, which are elliptical and rendered pointed by the

possession at each end of a long process. This process affords the most distinctive character of the species : it is expanded at the base and beset on each side with a double row of recurved hooks, which extend with the expanded base along the edge of the statoblast (figs. 1, 2, and 8).

Owing to the scantiness of the material, which consists of a single colony, it is not possible to give a fuller diagnosis, but the following further facts may be added. On the outside of the thick gelatinous ectocyst a number of unicellular algae

Fig. 2.



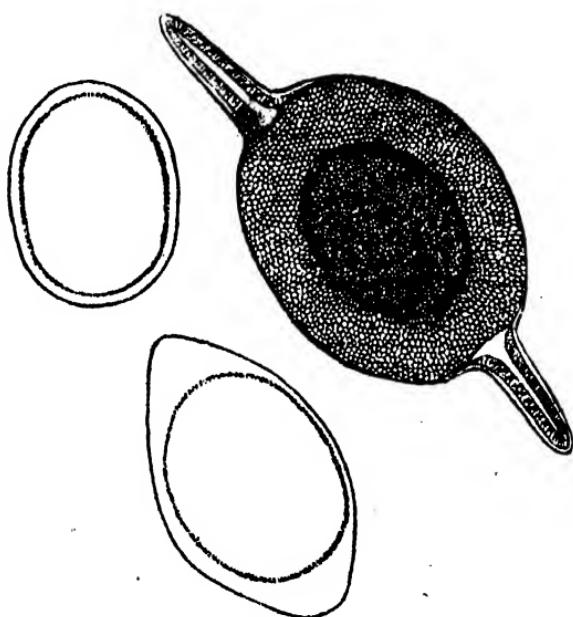
A statoblast of *L. capensis*, showing the splitting of the terminal processes previous to germination.

are lodged. The colony was killed by the use of cocaine and formaline. When the animals were being anaesthetized a counting was made of their tentacles. In one case there were in all 57 (error certainly not more than 3), in another in a less favourable position 70+ (probably about 74).

The average dimensions of the statoblasts are $.8 \times .64$ mm., the length not including the length of the processes, each of which measures $.32$ mm. The central capsule measured in one case 0.52×0.44 mm. The process, which is flattened in the same plane as the statoblast, is beset laterally with a double row of recurved hooks on each side, and these hooks extend to the edge of the expanded base of the process. The

processes split longitudinally in the plane in which the statoblast is flattened some time before the statoblast itself splits into its constituent valves (fig. 3). By counting the number of hooks on a given length of a process before it has split, and afterwards, it is found that there were twice as many before as after on a given length and that the distances between them are half as great. It thus appears that the hooks themselves do not split, but are arranged in a double row on each side, which, when splitting occurs, becomes divided into a single row on each side of each half of the process.

Fig. 3.

Three immature statoblasts of *L. capensis*.

Some immature statoblasts were sent by another collector to Dr. Rousselet, who, on hearing that I was describing the species, very kindly lent his preparation of them to me. Among the immature statoblasts are some which have the size and form of the central capsule. The terminal process is added last of all, during the completion of the development of the annulus (fig. 3).

Annandale ('Records of the Indian Museum,' 1907, vol. i. part ii. pp. 145-149) describes a new variety of *Lophopus*

lendenfeldi, var. *himalayanus* *, which apparently forms a link between the present species and *Lophopus crystallinus*. In this variety (i.) processes are present at the ends of some of the statoblasts, but are absent from others; (ii.) the central process is larger than the others, and bears, in addition to a distal circle of minute, curved, blunt processes, others which are arranged irregularly nearer the statoblast. It is easy to see how, by an increase in size of the central process of a statoblast like that of *Lophopus lendenfeldi*, var. *himalayanus*, a statoblast such as we find in *Lophopus capensis*, sp. n., might have arisen.

It is interesting also to notice that *Pectinatella davenporti*, a new species described by Oka, possesses a large number of processes beset with recurved hooks, somewhat resembling those of *L. capensis*, but differing from them chiefly in being very minute.

The fact that the statoblasts, although possessing a fairly well-developed annulus, sink to the bottom, calls for some attention; it may possibly explain the use of the hooks, which by catching in foreign objects would serve to prevent the statoblast from falling too far below the surface of the water to less well oxygenated layers. I have seen as many as six statoblasts linked into a chain by the interlocking of their hooks, and on one occasion, when I carried some of the statoblasts with me on a short railway journey, I found that through the shaking of the train every one of the statoblasts had become entangled in some floating green filamentous alga in the water containing them, and they remained in that position and hatched there. All the others which hatched in my possession were kept in open glass dishes in water not as much as 1 cm. in depth, while those kept in a tall vessel in water say 30 cm. deep did not hatch.

Braem, in discussing the germination of the statoblasts, emphasizes the importance of a position near the surface of the water for germination. He has shown that suspension of respiration is necessary to render the contents of the statoblast capable of germination. In general this is brought about by enclosure in ice. But the lack of oxygen in the bottom-mud is so great that a sojourn there was equally effective. In the case of *Cristatella*, he concludes, on indirect evidence (viz. the fact that statoblasts are found in the slimy bottom-mud), that the hooks, by catching in loose weed which afterwards sinks to the bottom, are the cause of

* The name *himalayanus* is given to the new variety on p. 147, but in the table on p. 148 it is called *indica*, apparently by oversight.

submersion of a great many of the statoblasts; the sunk statoblasts having been rendered capable of germination by deprivation of oxygen rise again, buoyed up by the annulus, after the entangling weed has completely decayed, and germinate at the surface. It would be interesting to know whether there are any direct observations on this point and whether all the statoblasts of *Cristatella* are equally buoyant. We cannot, of course, argue from one case to another; the conditions in a S.-African vlei are very different from those which obtain in the waters in which *Cristatella* lives. But it is worth while to note the various functions which have been attributed to the hooks.

Oka's remarks on the annulus and hooks are specially interesting in connexion with the present species. He lays stress on the importance as distributing-organs of the hooks on the statoblasts of *Cristatella* and of *Pectinatella magnifica*, "in which the annulus is but weakly developed and cannot serve as more than a mere buoy," contrasting this condition with the extreme insignificance of the minute hooks of *Pectinatella gelatinosa*, in which the annulus is very large and shows curvature.

In *Lophopus capensis*, in which the annulus does not even serve as a buoy, hooks would evidently have great importance in more than one respect, and to this is no doubt due their marked development.

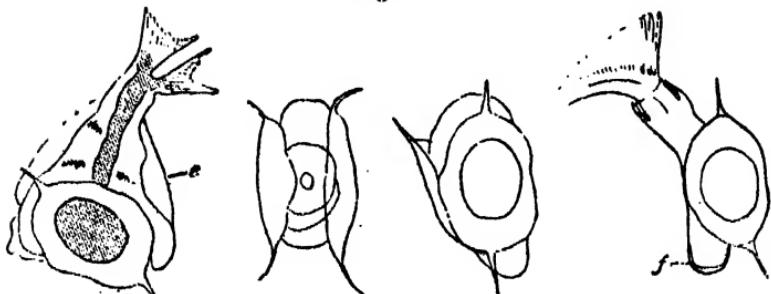
These foregoing cases might suggest that in general an inverse relation would be found to exist between the degree of development of the annulus and of hooks; but this does not prove to be supported by the facts. The relative dimensions of the central capsule and the annulus in *Plumatella vesicularis*, for example, which has no hooks, are, judging from Braem's figure, much the same as in *Lophopus capensis*, the total amount of air-space being, if anything, smaller in *P. vesicularis*. But the thickness of the wall of the central capsule of *Lophopus capensis* is noticeably greater than in any other statoblast I have seen figured; and as chitin is considerably heavier than water (sp. gr. 1.4), this may, perhaps, be sufficient to account for the incapacity of the statoblasts to float.

Apparently a period of cessation of respiration is not necessary to render the statoblasts of *Lophopus capensis* capable of germination, for those which I have been dealing with had but newly escaped from the parent colony when they came into my possession, and shortly afterwards the greater number of them hatched.

On Nov. 5, 1907, I first noticed that one or two of the

statoblasts had germinated, and after that quite a number of others did so. When germination occurs, or, rather, some

Fig. 4.



A young individual (B) shortly after germination in four positions, Nov. 5-7, 1907. e, ectocyst; f, thickened epithelium or foot.

Fig. 5.

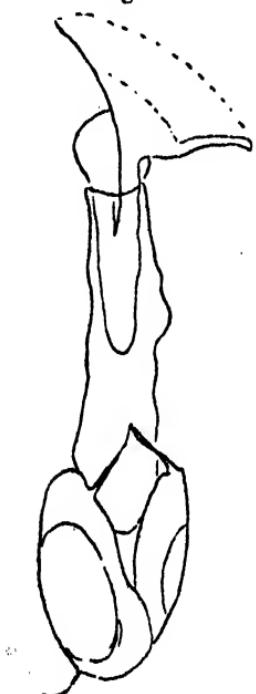


Fig. 6.

end

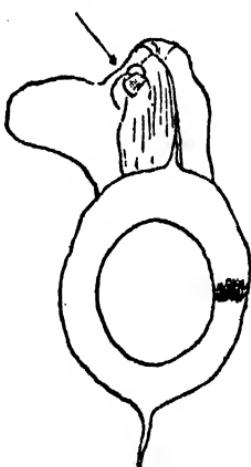


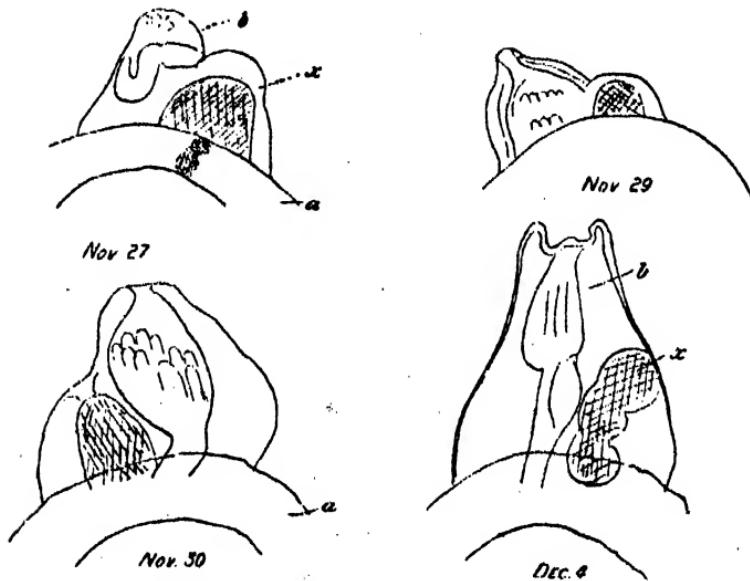
Fig. 5.—A young individual which emerged from its valves.

Fig. 6.—Individual B: appearance of bud when first noticed on Nov. 25, 1907. Zeiss obj. A, eyepiece 3.

time before that, the process splits lengthwise into two, one at each end of each valve, and each half then carries a single

row of hooks. After germination the float becomes much paler in colour and more transparent, and sometimes, but not always, the hooks drop off from the processes. When they do so the appearance of the valves is considerably altered. At first this changed appearance occasioned some doubt as to whether a second species was not present, but daily inspection of individual statoblasts showed that the fact is as I have just stated. Boiling the valves in weak caustic potash also removes the hooks.

Fig. 7.



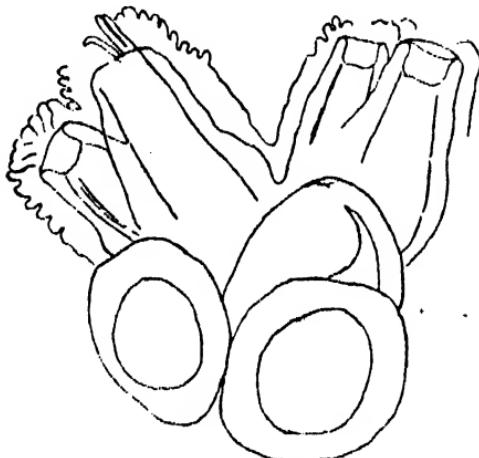
Four positions of the first bud, showing the accompanying degeneration of the original polypide B. Zeiss obj. A, eyepiece 3. a, annulus; b, bud; x, old individual.

The young individuals newly hatched from a statoblast have the power of holding on to a solid substratum by means of a thickened region of the ectoderm or foot (fig. 4). They can thus offer considerable resistance to the sucking of a pipette. They can also change their position relatively to the valves. One individual (fig. 5) emerged from its valves, remaining adherent to them only by its foot. An ectocyst is shown in fig. 4, and was noticed in a number of other cases. It is most probable that in those figures in which it is

omitted it was merely overlooked owing to its extreme transparency at this early stage and to the fact that weeds had not as yet settled upon it.

Three weeks after hatching (on Nov. 25) two individuals were seen to show signs of budding; the parent was retracted, and though I watched it constantly I never saw it expand its tentacles again, though dilatation and contraction of the body-wall occurred. The retracted tentacles of the parent lost their outlines and became an opaque mass (fig. 7), and when the young bud grew more active and expanded considerably (Dec. 4), it was clear that the original polyp had degenerated. The two individuals had reached this stage of

Fig. 8.



Young colony formed of descendants of individual B, Jan. 16, 1908.
Zeiss obj. A, eyepiece 2.

budding when I left them until Jan. 15, 1908. I then found that one was dead, and the other had given rise to a colony (individual B, fig. 4) of four polypides. The valves of the statoblast were still adherent to the young colony (fig. 8). An ectocyst was present, but had to be looked for with great care even after its presence was known, as it was so exceedingly transparent and presumably of a refractive index not differing much from that of water; its surface is deeply folded or wrinkled in parts, as seen in fig. 5. The polypides fed actively, and soon buds appeared. On Jan. 20 I most unfortunately handled the colony with a pipette which had been used in a

solution of weak caustic potash. This caused the ectocyst to become opaque and swell up. On Jan. 22 I noticed that the orifices in the ectocyst had been closed by this swelling and the polypides were trying in vain to emerge. I consequently removed with needles the caps of ectocyst which shut in each of the four individuals, and all the four polypides then expanded and fed on that day and on the thirteen days following it. On Feb. 4 one individual had lost half of its lophophore, and on the succeeding days the other individuals one by one vanished. To what cause this disappearance was due I was not able to determine. Individuals of *Cyclops* were present in the water, but I removed these as soon as the first individual was noticed to be imperfect.

A second batch of statoblasts hatched at the end of March and beginning of April, but none of these lived long, probably because the supply of minute green algae which came with them from Africa had run out.

Rousselet comments on the small number of Polyzoa known from African freshwaters, the total then being eight species. *Lophopus capensis* is the ninth, and it is noticeable that of nine species three would belong to Rousselet's genus *Lophopodella* if that genus were to stand. But, as Annandale remarks, the chief character in which *Lophopodella* differs from *Lophopus* is the presence of hooked processes at the extremities of the statoblast; and seeing that *L. lendenfeldi*, var. *himalayanus*, possesses statoblasts some of which bear hooked processes while others lack them, the importance of this character in classification is weakened, and it can hardly be regarded as of generic value. The species of *Lophopodella* should therefore be included in *Lophopus*.

In conclusion, I wish to thank Dr. Harmer for much kind help and interest.

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XXXII.—*New African Phlebotomic Diptera in the British Museum (Natural History).*—Part IV. *Tabanidae (continued).* By ERNEST E. AUSTEN*.

TABANINAE.

Genus *Hæmatopota*, Mg. (*continued*).

Hæmatopota puniens, sp. n.

♀.—Length (1 specimen) 9·6 mm.; width of head just over 3 mm.; width of front at vertex 1·2 mm.; length of wing 8·4 mm.

Sepia-coloured; dorsum of thorax with narrow light grey stripes; dorsum of abdomen with hind borders of all segments, a narrow median stripe on each segment from second to sixth inclusive, and two rows of admedian spots (conspicuously elongate on segments 2 to 6 inclusive) smoke-grey; wings mouse-grey † or drab, light markings well-defined when seen against a dark background, usual three rosettes present, composed of rather coarse markings, apical sinuous mark not bifurcate; all tibiae with two pale bands, and also pale at extreme base.

Head smoke-grey, front mouse-grey except lateral margins (which broaden out on vertex and also so as to include lateral frontal spots) and a median pearl-grey stripe from occipital margin to just beyond median frontal spot, around which it expands in form of a spear-head; *frontal callus* mummy-brown, of medium depth, extending from eye to eye, its upper margin slightly concave on each side of middle line, lower margin excavated above antennæ; a small median seal-brown spot below callus, not descending to level of base of antennæ; clove-brown lateral frontal spots obliquely elongate, not in contact with eyes, median frontal spot small but distinct; *palpi* isabella-coloured, terminal joint elongate but blunt at tip, clothed on outer side with minute black hairs and below with short whitish hairs; *antennæ* light mummy-brown, first joint somewhat darker, cylindrical and scarcely incrassate, third joint elongate, hardly expanded at base, last three annuli missing. *Thorax*:

* For Parts I., II., and III. see Ann. & Mag. Nat. Hist. ser. 8, vol. i. pp. 209-228 and 401-428, and ser. 8, vol. ii. pp. 94-116.

† For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company 1890).

dorsum with lateral borders, an entire narrow median longitudinal stripe (slightly broader posteriorly), a pair of admedian stripes (interrupted beyond transverse suture), and a short and broader stripe on each side, extending from upper angle of praesutural depression to hind border and continued round scutellum, light grey or pearl-grey; usual crescentic marks on hind border (continuations of admedian stripes) divided or partially so; dorsum, including scutellum, clothed with minute, appressed, deciduous, pale yellow hairs; pleurae and pectus light grey. *Abdomen*: dorsum of each segment with a pair of smoke-grey admedian spots, those on second and following segments not in contact with hind margin; venter grey, clothed with minute, appressed, pale yellowish hairs, hind margin of third and following segments, and of second segment except at sides, cream-coloured, a gradually expanding clove-brown median stripe, interrupted on hind margins of segments, starting on third segment and extending to distal extremity. *Wings* very similar in coloration and markings to those of *H. insidiatrix*, Austen, but pale markings not quite so light in colour and slightly coarser, and no trace of light fleck near distal margin of second submarginal cell, beyond apical sinuous mark; *stigma* seal-brown, conspicuous, of moderate length, with a distinct light mark running up to costa at its proximal extremity; no conspicuous dark blotch below stigma; discal cell with two approximate transverse light marks (distal one divided) in its middle portion, a large light spot in its distal third, and a minute and indistinct light fleck near its proximal extremity; disconnected oblique light marks across posterior cells divided or partly divided; a series of not very conspicuous light blotches along hind margin, in distal angles of posterior cells except fourth; some minute light flecks near distal extremity of anal cell; light markings in basal, anal, and axillary cells of normal type, zigzag mark and light loop in axillary cell conspicuous but not connected, light blotch on sixth vein beyond zigzag mark of fairly large size and distinct; *alula* with pale border. *Halteres* cream-buff, knob pale seal-brown above and below. *Legs*: femora pale greyish chocolate; tibiae and middle and hind tarsi dark brown, extreme bases of tibiae and pale bands on latter, as also basal half or two-thirds of first joint of middle and hind tarsi, buff; front tarsi clove-brown; neither front nor hind tibiae incrassate.

Northern Nigeria: Little Koriga River, 18. vii. 1907
(J. Brand).

Hæmatopota puniens is very closely allied to *H. abyssinica*, Surcouf, of which it may ultimately prove to be a local race;

judging from a comparison of the type of *H. puniens* with a co-type of *H. abyssinica* kindly presented by M. Surcouf, *H. puniens* is distinguished by coarser and more closely knit wing-markings, a distinctly shorter stigma, at the proximal extremity of which there is a more conspicuous pale mark, and by the greater distinctness of the lower band on the front tibiae. From other species with similar abdominal markings, such as *H. mactans*, Austen, *H. stimulans*, Austen, and *H. furtiva*, Austen, and allied species, *H. puniens* may be distinguished at once, *inter alia*, by there being no trace of a bifurcation in the apical sinuous mark in the wing and by the presence of two pale bands on the front tibiae; the elongate shape of the large admedian abdominal spots and the narrowness of the median stripe on the abdominal segments (even the stripe on the second segment is in no way expanded towards the hind margin) afford further characters for the recognition of this species. Among the specimens of *Hæmatopota* from N. Nigeria, presented by Mr. Brand, is a female from Garran Gabbus, July 1907, which is evidently closely allied to *H. puniens* but apparently belongs to a distinct species. The individual in question agrees with the type of *H. puniens* in the markings on the tibiae, but differs in having the first joint of the antennæ much more swollen, as well as paler at the base and darker at the tip, in the stigma being less complete, and in the presence of a light streak beyond it along the costa; the specimen is in very bad condition, and the abdomen (evidently owing to the presence and decomposition of contained blood) is so distorted that little can be seen of its markings, but there are traces of elongate grey spots on the dorsum.

Hæmatopota sanguinaria, Austen.

(Ann. & Mag. Nat. Hist. ser. 8, vol. i. May 1908, p. 417.)

Since this species was described, from a specimen from Kasempa District, N.W. Rhodesia, three additional examples have been received from N.E. Rhodesia, including 2 ♀♀ from Luenya District, 9. ix. 1904 (*R. L. Harger*),—one caught at noon and the other taken by the donor on his own thumb about 7.30 P.M.,—and 1 ♀ from the Kafulafuka River, Kapopo District, Sept. 1904 (*J. F. F. Johnson*). This fresh material agrees with the type and paratypes in all respects except size, the new specimens measuring 9.5 mm. instead of 8 to 8.6 mm. in length.

Hæmatopota gracilis, sp. n.

♀.—Length (1 specimen) 8·4 mm.; width of head 2·4 mm.; width of front at vertex 1 mm.; width of fourth segment of abdomen 1·8 mm.; length of wing 7·4 mm.

Narrow-bodied species, without spots or median stripe on abdomen or bands on tibiae.—Frontal callus not extending from eye to eye; dorsum of thorax dark greyish brown, with not very distinct longitudinal grey stripes; dorsum of abdomen olive-brown, with a yellowish grey sheen, unicolorous; wings sepia-coloured, moderately dark, light markings distinct and relatively simple, rosettes present and each composed for most part of a single series of more or less disconnected marks, apical sinuous mark slender, not bifurcate.

Head: face smoke-grey, front yellowish grey, vertical region brownish; lateral frontal clove-brown spots moderately large, conspicuous, not in contact with eyes, median frontal spot wanting or indistinct; frontal callus bistre, rather narrow from above downwards, rounded at extremities, which are distinctly separated from eyes, somewhat triangular in outline, upper margin rising to a point in middle line, lower margin nearly parallel with upper on each side of middle line; no dark median spot below callus; palpi isabella-coloured, terminal joint moderately expanded at base, tapering to a point at distal extremity, clothed on outer side with rather rough-looking black hair and on under side with a few whitish hairs; antennæ slender, first and second joints pale ochraceous buff, third joint russet, last three annuli darker, terminal annulus mummy-brown at tip, longer than two preceding annuli taken together, first joint of antennæ not incrassate, short, clothed with black hairs towards tip, upper angle of second joint not produced, third joint elongate, tapering, but little expanded at base. *Thorax:* dorsum greyish in front, where there is a faint indication of commencement of a very narrow median grey stripe, a pair of broader admedian grey stripes also visible, but dying away about half-way between transverse suture and hind margin, no distinct grey crescentic marks on latter; pectus, pleurae, and sides of dorsum smoke-grey; scutellum of same colour as dorsum. *Abdomen:* dorsum clothed with minute, appressed, buff-yellow hairs, no light hind borders to segments, though extreme hind margins narrowly pale (cream-buff); venter olive-grey or smoke-grey, clothed with minute appressed yellowish hairs, hind margins of segments narrowly pale, an ill-defined dark median longitudinal stripe visible when venter is viewed from certain angles, invisible from

others. *Wings*: apical sinuous mark commencing in distal extremity of marginal cell, above end of second longitudinal vein; immediately beyond *stigma*, which is dark brown, long, complete, and well-marked, is a small and not very distinct light mark, looking something like the figure 8 with its upper half blurred; no light mark running up to costa at proximal end of stigma; series of detached oblique light marks across posterior cells conspicuous; no light spots on hind margin, in distal angles of posterior cells; light marks in basal cells of normal type; zigzag mark and basal loop in axillary cell present, but not connected, *no light spot on sixth longitudinal vein beyond zigzag mark*; discal cell with two widely separated transverse light marks (in one wing of type also an indistinct light fleck in proximal extremity). *Halteres*: stalk cream-buff, knob dark brown. *Legs*: femora greyish fawn, tibiae cinnamon-coloured, front and hind pairs brown or brownish at tip, front tarsi dark brown, last joint and tips of preceding joints of middle and hind tarsi brown, first joint of middle tarsi except tip and basal half of first joint of hind tarsi cream-buff, *neither front nor hind tibiae in the slightest degree incrassate*.

Northern Nigeria; Little Koriga River, 18. vii. 1907
(*J. Brand*).

I have little hesitation in regarding as conspecific with the ♀ described above a single ♂ from Keffi, Nassarawa Province, N. Nigeria, 16. ix. 1907, "in house" (*Dr. R. F. Williams*). Assuming this belief to be correct, the ♂ of *H. gracilis* may be characterized as follows:—

♂.—Length (1 specimen) 8·8 mm.; width of head 3 mm.; width of fourth segment of abdomen 1·5 mm.; length of wing 7·5 mm.

Thorax (including scutellum), wings, halteres, and legs as in ♀ (femora somewhat darker), abdomen narrower (at least in typical specimen), first four segments cinnamon-coloured, last three segments olive-brown, dorsum with a yellowish grey pollinose sheen when viewed at a low angle.

Head: terminal joint of *palpi* bluntly cylindrical-ovate, mouse-grey, clothed with fine blackish brown hair; first joint of *antennæ* short, slightly incrassate, buff-coloured, second joint likewise buff, third joint extremely slender, scarcely wider at base, ochraceous buff, usual patch of minute black hairs conspicuous just beyond base on upper side, distal extremity of terminal annulus dark brown. *Abdomen*: dorsum slightly darker at base of first and towards hind margin of fourth segment, clothed throughout with blackish mingled with pale yellow hairs; venter clothed with minute,

appressed, yellowish hairs, its coloration similar to that of dorsum, but first two and distal portion of third and fourth segments, as well as sides of fourth segment, somewhat more infuscated. *Wings*: in discal cell of right wing of typical specimen proximal transverse light mark is connected with a light spot of some size in proximal extremity of cell, which is absent in left wing.

Hæmatopota gracilis is not closely allied to any of its African congeners at present known to me: apart from the wing-markings, the shape and coloration of the antennæ and frontal callus, the coloration of the legs, and the non-incrasate front tibiae will at once serve to distinguish it from *H. lacesens*, Austen, a smaller and darker species which also occurs in Northern Nigeria.

Hæmatopota coronata, Austen.

(Ann. & Mag. Nat. Hist. ser. 8, vol. ii. July 1908,
p. 100.—Somaliland.)

♂.—Length (1 specimen) 10·6 mm.; width of head 3·6 mm.; length of wing 8·2 mm.

Sepia-coloured, with smoke-grey or drab-grey markings; apart from secondary sexual characters, agreeing in all essential respects with ♀; spots on dorsum of fifth and sixth abdominal segments somewhat elongate.

Head: frontal triangle with an elongate clove-brown median mark, extending from base of antennæ half-way towards junction of eyes, with a small, shining, dark mummy-brown spot on each side of its upper extremity; an ill-defined brownish area on each side of base of antennæ; *palpi* coloured as in ♀, terminal joint clothed with fine yellowish hairs, cylindrical-ovate, distal extremity somewhat elongate; *antennæ* (especially first joint, which is somewhat more incrasate) shorter than in ♀.

Haithalhim, near Aden, Arabia, 20. iii. 1895 (Lt.-Col. Yerbury).

The occurrence of this Somaliland species in the Arabian portion of the East-African Sub-Region of the Ethiopian Region is, of course, in no way surprising, since other and better-known African Diptera, such as *Tabanus biguttatus*, Wied., and a tsetse-fly (*Glossina tachinoides*, Westw.) are found on the eastern shore of the Strait of Bab-el-Mandeb.

Hæmatopota tenuis, sp. n.

♀.—Length (2 specimens) 8·2 to 8·4 mm.; width of head (2 specimens) 2·4 mm.; width of front at vertex (2 speci-

mens) 1 mm.; maximum width of thorax (3 specimens) 1·8 mm.; width of base of abdomen (3 specimens), measured across hind margin of first segment, 2 mm. to just over 2 mm.; width of base of sixth segment of abdomen (1 specimen) 1·4 mm.; length of wing (3 specimens) 7·2 to 7·5 mm.

Narrower than H. gracilis.—*Sepia-coloured, with isabella-coloured or yellowish grey markings; dorsum of thorax with usual three longitudinal stripes, either entire or fused together from a point about one-third of distance between transverse suture and hind margin, admedian stripes prolonged into usual crescentic marks on latter; dorsum of abdomen with yellowish grey or smoke-grey hind border to each segment, a more or less distinct and similarly coloured narrow median stripe on each segment from second to sixth inclusive, and second and following segments each with a pair of more or less distinct smoke-grey or yellowish grey admedian spots, sometimes obsolete or nearly so on second and third segments, elongate on following segments; wings sepia-coloured, moderately dark, light markings distinct, sharply defined, and rather coarse, rosettes present, apical sinuous mark not bifurcate, but a light fleck beyond it on wing-margin in second submarginal cell; femora and tibiæ mummy-brown, femora except tips lighter, front tibiæ with a single indistinctly marked pale band at base, then darker brown, middle and hind tibiæ with two pale bands.*

Head: front yellowish brown, lighter at sides, with a dark brown blotch on vertex on each side of median line; face and jowls yellowish grey, face with a clove-brown fleck on each side, in contact with lower inner margin of eye and slightly below level of antennæ, and with a small clove-brown spot below each antenna; lateral frontal clove-brown spots large, conspicuous, more or less obliquely elongate, narrowly in contact with eyes, median frontal spot small, inconspicuous; *frontal callus* clove-brown, of moderate depth, extending from eye to eye, upper margin slightly concave on each side of median line or practically straight, lower margin excavated above antennæ; a small clove-brown spot present in middle line below callus, with which it is in contact; *palpi* isabella-coloured, terminal joint moderately elongate, slightly expanded at base and rather blunt at tip, sparsely clothed on outer side with short black hairs; *antennæ* russet-brown, third joint slightly darker, last three annuli mummy-brown, noticeably flattened from side to side and blunt at tip, first joint of antennæ somewhat elongate and slightly incrassate when viewed from above, clothed with short, rough, black hairs, *upper angle of second joint not produced*, third joint narrow, scarcely expanded beyond base. *Thorax:* dorsum

clothed with minute, appressed, deciduous, pale yellow hairs; pectus, pleurae, and sides of dorsum yellowish grey; scutellum yellowish grey, with a sepia-coloured blotch on each side of middle line, starting from base, but not reaching lateral or hind border. *Abdomen*: dorsum clothed with minute, appressed, yellowish hairs; second segment with a transversely elongate smoke-grey blotch on anterior border, extending on each side of middle line to a distance half-way or less between middle line and lateral margin of segment; median stripe on second segment sometimes slightly expanded posteriorly; venter clothed with minute, appressed hairs, somewhat paler than those on dorsum, hind margins of segments smoke-grey, segments elsewhere either mouse-grey, with a more or less ill-defined, brownish, longitudinal median stripe, or dark brown, and, in case of first four segments, grey on sides. *Wings*: a series of sometimes large and conspicuous, sometimes more or less indistinct light blotches on hind margin in distal marginal angles of all posterior cells, followed by an elongate light blotch occupying distal angles of axillary and anal cells, and proximal marginal angle of fifth posterior cell; series of detached oblique light marks across posterior cells distinct, and usually connected with marginal blotches; light marks in basal cells of normal type; zigzag mark across anal and axillary cells and light loop surrounding proximal angle of axillary cell clearly defined, and connected by a less distinct pale border running along or close to anal angle; light blotch present on sixth longitudinal vein, beyond zigzag mark; rosettes compound, that is with centres formed by more or less detached light spots; sometimes a small and more or less indistinct light fleck on or close to upper branch of third vein, beyond apical sinuous mark, apparently representing, with light fleck on distal border of second submarginal cell, last vestiges of an outer ramus of apical sinuous mark, which has disappeared; discal cell with two rather widely separated transverse light marks, and a larger or smaller light spot close to its distal extremity; *stigma* well marked, dark brown or bistre, its proximal extremity cream-buff, and a sharply defined small light semicircular mark (upward extension from distal rosette) immediately beyond its distal extremity, next costa. *Halteres* cream-buff or cream-coloured, knob seal-brown at base above and below. *Legs*: front and hind tibiae slightly incrassate, pale bands on hind tibiae rather indistinct; front tarsi dark brown, first three joints sometimes paler at base, first four joints of middle and hind tarsi buff with dark brown tips, last joint of middle and hind tarsi dark brown.

Uganda: type and two other specimens from the Nile Province, 1906 (*the late Dr. W. A. Densham*). With these flies the Museum received from the same collector and locality a damaged ♀ *Hæmatopota*, which, though presenting a superficial resemblance to *H. tenuis*, it seems advisable for the present to regard as belonging to a distinct species. The specimen, which is devoid of antennæ and front legs, and cannot therefore be described in detail, differs from the three examples of *H. tenuis* as follows: Dimensions of body larger (length 9·2 mm. instead of 8·2 to 8·4 mm.); palpi smaller; abdominal spots larger and much more conspicuous, sharply defined and distinct on second and third as well as following segments; dark median stripe on venter more sharply defined; wings paler, light markings in discal cell and portion of first posterior cell above it different (transverse marks fused together or in contact), no light fleck on wing-margin beyond apical sinuous mark. The donor's field-note attached to this specimen, but probably meant to apply also to the three examples of *H. tenuis*, is as follows:—"Found generally throughout the Province; occurs only in small numbers; frequently bites natives."

Apart from the species represented by the fourth specimen referred to above, if it be indeed distinct, *H. tenuis* is distinguishable by its unusually narrow and elongate shape from all of its African congeners at present known to me. From *Hæmatopota fusca*, Austen, which also occurs in Uganda, it is further distinguished, *inter alia*, by its paler coloration, conspicuously striped thorax, only slightly incrassate first antennal joint, and more fully marked wings.

Hæmatopota insatibilis, sp. n.

♀.—Length (4 specimens) 6·8 to 8·4 mm.; width of head 2·8 to just over 3 mm.; width of front at vertex just under to just over 1 mm.; length of wing 6·5 to 7·8 mm.

Stoutly built species, with conspicuous transverse light streak close to apex of wing.—Dorsum of thorax dark brown, with usual three stripes smoke-grey, more or less indistinct except in front; dorsum of abdomen mummy-brown to dark brown, hind borders of segments greyish buff, third and following segments sometimes each with a pair of yellowish grey admedian spots in contact with front margin; wings sepia-coloured, fairly dark, light markings sharply defined, rosettes and oblique marks across posterior cells largely broken up into dots; legs clove-brown, middle femora lighter except at tip, front tibiæ and tarsi black, front tibiæ with a single broad white or cream-

coloured band at base, middle and hind tibiæ each with two cream-buff bands.

Head: front mouse-grey, narrowly lighter grey at sides and round lateral frontal spots, of only moderate width, its sides parallel or nearly so, a dark brown subtriangular patch sometimes visible on vertex, not extending to eyes and incompletely divided by a narrow light grey median stripe; face and jowls smoke-grey, a more or less well-marked dark brown area between base of each antenna and eye on same side, and a dark brown streak extending inwards from lower inner margin of each eye, below level of antennæ; lateral frontal spots black, large, and conspicuous, in contact with eyes and almost descending to frontal callus, median frontal spot inconspicuous or obsolete; *frontal callus* clove-brown, deep or moderately deep, extending from eye to eye, upper margin straight or slightly curved, lower margin excavated above base of antennæ, a conspicuous quadrate median black spot in contact with lower margin of callus, and descending to level of upper margin of base of antennæ; *palpi* isabella-coloured, terminal joint elongate, clothed on outer side with black mixed with pale yellowish hairs; *antennæ* clove-brown, first joint lighter on inner side and below, elongate and incrassate, truncate elliptical when viewed from above, upper angle of second joint produced, third joint somewhat paler especially on inner side, elongate and but little expanded at distal extremity of basal third, last three annuli deep clove-brown or black, conspicuously flattened from side to side. **Thorax:** dorsum (including scutellum) clothed with shining pale yellow deciduous hair, usual grey crescentic marks visible on hind border; pectus and pleuræ smoke-grey; scutellum smoke-grey pollinose, with dark brown blotch on each side of middle line at base. **Abdomen:** dorsum with hind borders and lateral margins of segments clothed with pale yellowish hairs, elsewhere clothed with minute black hairs; venter clothed with minute, appressed, pale yellowish hairs, ochraceous buff, fourth (or fifth) and following segment) brownish to dark brown, hind borders of segments cream-buff or cream-coloured. **Wings:** usual three rosettes present, but partially altered in appearance owing to distal and median rosette, and distal half of proximal one, being largely broken up into dots; apical sinuous mark transformed into a transverse light marking, conspicuous and fairly broad, especially below, running from beneath end of second longitudinal vein to margin of wing in middle and lower half of second submarginal cell; hind margin with series of more or less conspicuous, larger or smaller light blotches in distal

marginal angles of posterior cells (sometimes wanting in first and fourth posterior cells), a larger or smaller light blotch also occupying distal angle of axillary cell and sometimes extending into distal angle of anal and proximal marginal angle of fifth posterior cell; basal cells with markings of normal type; anal cell with zigzag mark and basal loop conspicuous and with a more or less distinct connection running along anal angle; a light spot, sometimes divided into two, on sixth longitudinal vein beyond zigzag mark; discal cell in middle third with two transverse light marks, each usually divided into two spots, also with larger or smaller light spot in proximal angle, and sometimes with similar spot or transverse mark near distal extremity; *stigma* well marked, dark mummy-brown, its proximal extremity cream-buff; marginal cell with small light loop enclosing dark centre immediately beyond distal extremity of stigma. *Halteres*: knob cream-buff, slightly brownish at base above and below, stalk cream-coloured. *Legs*: front tibiae incrassate, hind tibiae not swollen: proximal two-thirds of first joint of middle and hind tarsi cream-buff.

Nyasaland Protectorate: two specimens (co-types) from the Zomba Plateau (*Sir Alfred Sharpe, K.C.M.G., C.B.*); a third specimen from Kasungu Mt., Nyika, 4. iii. 1896 (*Captain Richard Crawshay*); a fourth example of this species (which I have been enabled to examine by the courtesy of Lt.-Colonel Manders, R.A.M.C.) from the Aufiri River, Nyasaland Protectorate, 10. xii. 1907 (*Captain Hallam Hardy, R.A.M.C.*), is in the collection of the Royal Army Medical Corps College, Millbank, S.W.

In the markings of its wings, especially as regards the shape and direction of the apical sinuous mark, *Hematopota insatiabilis* closely resembles *H. divisapex*, Austen, the co-types of which are from the Katanga District of the Congo Free State; the new species, however, may be distinguished from the latter by the dark and much more swollen first joint of the antennæ, and by its hind tibiae having two pale bands, instead of only a single pale band at the base.

Hematopota taciturna, sp. n.

♀.—Length (1 specimen) 9·5 mm.; width of head 3 mm.; width of front at vertex 1 mm.; length of wing 8·2 mm.

Dark sepia-coloured; frontal callus deep, clove-brown and prominent; antennæ clove-brown, first joint strongly incrassate; dorsum of thorax with usual three longitudinal stripes smoke-grey; dorsum of abdomen with hind border of each segment

except last and a pair of admedian spots on each segment except first smoke-grey, second segment also with a smoke-grey median stripe starting from hind border and scarcely reaching front margin, third and following segments except last each with more or less distinct though incomplete smoke-grey median stripe; wings sepia-coloured, fairly dark, light markings sharply defined, usual three rosettes present, apical sinuous mark bifurcate; legs seal-brown to clove-brown, front tibiae with a narrow pale band close to base, middle tibiae with two pale bands, hind tibiae with a narrow pale band near base and apparently with a similar band on distal third.

Head: front mouse-grey, with a narrow lighter edging round lateral frontal spots and on extreme lateral margins, vertex with clove-brown subtriangular median blotch, not extending to lateral margins and divided in middle line by narrow light grey stripe running upwards from median frontal spot; face and jowls light grey, a conspicuous clove-brown band extending from lower inner margin of each eye to base of antenna; lateral frontal spots clove-brown, conspicuous, narrowly separated from eyes, median frontal spot small and inconspicuous; *frontal callus* extending from eye to eye, its upper margin concave on each side of middle line; a small clove-brown spot in middle line below callus; basal joint of *palpi* dark mouse-grey (terminal joint wanting in type); first joint of *antennæ* elliptical-oval when viewed from above, upper angle of second joint not prominent (third joint wanting in type). *Thorax*: dorsum with median longitudinal stripe complete, admedian stripes obsolete a little way beyond transverse suture, usual crescentic marks on hind margin distinct, smoke-grey; pectus, pleuræ, sides of dorsum, and a broad hind border to scutellum smoke-grey. *Abdomen*: dorsum with lateral borders of first five segments smoke-grey, deepest on sides of first segment and progressively diminishing in depth; venter (except last segment, which is clove-brown) mouse-grey, with broad clove-brown median stripe, interrupted on hind margins of second and following segments, which are narrowly cream-buff. *Wings*: outer ramus of apical sinuous mark starting from costa in first submarginal cell, beyond end of second longitudinal vein, and meeting margin of wing again a little above lower branch of third longitudinal vein, rather broad below; inner ramus of apical sinuous mark commencing in first submarginal cell and extending only a short distance below upper branch of third longitudinal vein; in type a row of light blotches along hind margin, in distal marginal angles of all posterior cells, and an additional light blotch in distal angle

of axillary cell; usual series of oblique marks across posterior cells partly broken up into spots; markings in basal cells of normal type; a large light blotch on sixth longitudinal vein, beyond zigzag mark; light loop in basal angle of axillary cell large and well-marked, but not connected with zigzag mark, which, in case of type, becomes indistinct before reaching hind margin; discal cell with two transverse light marks (the distal one interrupted) across median third, a minute light fleck in proximal angle, and a large and conspicuous transversely elongate light mark close to distal extremity; *stigma* well-marked and conspicuous, dark mummy-brown, an ill-defined cream-buff blotch next costa at its proximal extremity, and, in case of type, an elongate curved light mark (upper portion of distal rosette) immediately beyond its distal end; dark sepia-coloured quadrate blotch below stigma extending to third longitudinal vein without contracting in width, and conspicuous when wing is viewed against a dark background. *Halteres*: knob sepia-coloured, stalk-cream-buff. *Legs*: front tibiae slightly incrassate; basal half or rather more of first joint of middle tarsi, like bands on middle tibiae, cream-buff; hind tarsi of type missing.

Anglo-Egyptian Sudan: Blue Nile, 1905 (received from Dr. Andrew Balfour).

Hæmatopota taciturna resembles *H. mactans*, Austen, to a certain extent in the abdominal markings, as also in the apical sinuous mark in the wing being bifurcate, although, in the case of the type of *H. taciturna* at any rate, the distal ramus is not so close to the tip of the wing: the new species can be distinguished from *H. mactans* by its darker wings, in which, especially in the basal half, the light markings are less extensive, by its much deeper and darker frontal callus, darker antennæ, and much narrower and less conspicuous pale bands at the base of the front and hind tibiae.

Hæmatopota hirsutitarsus, sp. n.

♀.—Length (1 specimen) 9 mm.; width of head 3 mm.; width of front at vertex 1 mm.; length of wing 8·6 mm.

Dorsum of thorax dark sepia, with usual grey markings; *dorsum of abdomen* dark mummy-brown on second and third segments, elsewhere dark sepia, hind margins of second and following segments yellowish grey, sixth segment with pair of small yellowish grey admedian spots on basal half, in typical specimen faint indications of similar spots on three preceding segments; *wings* sepia, fairly dark, light markings sharply

defined and conspicuous, usual three rosettes present, centres of proximal and middle rosettes filled out with light blotches; front legs clove-brown, middle and hind legs seal-brown, front and hind tibiae each with a single pale band, middle tibiae with two pale bands and extreme base also pale, front tarsi unusually hairy below and at tips of joints, front tibiae with a series of fine but prominent and conspicuous hairs at regular intervals on outer margin.

Head: front mouse-grey, its sides diverging very slightly below, extreme lateral margins, a subquadrate fleck on each side of vertex, a ring surrounding median frontal spot, and a narrow median stripe, running upwards from latter to vertex and dividing usual vertical subtriangular dark brown blotch, light grey; face and jowls smoke-grey, upper part of sides of face somewhat speckled with brown, and a small dark brown fleck extending inwards from lower inner margin of each eye; lateral frontal clove-brown spots oval, large and conspicuous, narrowly separated from eyes, median frontal spot inconspicuous or obsolete; *frontal callus* dark sepia, of only moderate depth, extending from eye to eye, upper margin convex, lower margin excavated above each antenna; *no dark median spot below callus*; *pulpi* drab-grey, terminal joint somewhat stout, tapering to tip but not elongate, clothed on outer side with black mixed on basal half with yellowish hairs, and on upper and under side of basal half with longer yellowish hairs; first and second joints of *antennae* mummy-brown, first joint slightly greyish pollinose, somewhat elongate, stout and cylindrical but not incrassate, upper angle of second joint moderately produced (third joint wanting in type). *Thorax:* dorsum with median grey stripe narrow in front, broader behind, interrupted in middle, admedian stripes disappearing as usual beyond expansion behind transverse suture, usual grey crescentic marks present on hind margin; pectus, pleuræ, sides of dorsum, and hind border of scutellum smoke-grey, disc of scutellum dark sepia; dorsum (including scutellum) clothed with minute, deciduous, appressed, shining, yellowish white hairs. *Abdomen:* dorsum with lateral margins of first four segments grey, sides and hind borders of segments clothed with pale yellowish or whitish yellow hairs, dorsum elsewhere clothed with dark brown or blackish hairs; venter without dark longitudinal median stripe, first two segments smoke-grey, third and fourth segments mouse-grey, last three segments dark brown and clothed for most part with blackish hair, second, third, and fourth segments of venter clothed with minute, appressed, pale yellowish hair, hind margins of second and following

segments except last narrowly yellowish grey. *Wings*: apical sinuous mark in type somewhat coarse and widely interrupted in second submarginal cell, in middle of distal margin of which (*i. e.* on wing-margin) there is an ill-defined light blotch; a series of light blotches on hind margin of wing, in distal marginal angles of first, second, third, and fifth posterior cells, while a fifth light blotch covers tip of sixth longitudinal vein (in type blotches in distal marginal angles of third and fifth posterior cells larger than remainder, blotch in distal marginal angle of fifth posterior cell especially large and conspicuous); usual series of oblique light marks across posterior cells, some of them continuous with marginal blotches; middle rosette well developed, proximal rosette especially conspicuous, owing to its central area being filled out with light blotches; discal cell in type with a nearly unbroken light area occupying proximal third, and two semi-interrupted light marks at distal extremity; markings of basal cells normal in character, proximal as well as distal extremities of these cells occupied with light markings; in axillary cell zigzag mark and basal loop connected by an unusually broad light band running round margin of anal angle; *alula* light, with dark centre; *stigma* mummy-brown, well developed and elongate, a well-marked subquadrate light blotch connecting costa and proximal rosette at proximal extremity of stigma, and a conspicuous light loop (upper portion of distal rosette) in marginal cell beyond distal extremity of stigma; below stigma a subquadrate area of dark colour extending undiminished in width to below third longitudinal vein. *Halteres*: knob dark sepia, stalk cream-coloured. *Legs*: pale bands on tibiæ and basal half or rather more of first joints of middle and hind tarsi buff; band on hind tibia narrower than that on front tibia, latter band not very broad; front tibiæ incrassate, hind tibiæ stouter than middle tibiæ; middle and hind tibiæ clothed with appressed pale yellowish hairs; front tarsi with long, blackish, fine, curling or curved hairs beneath, and long straight hairs at tip of each joint on each side and also above.

Angola: Benguella, June 1905 (*Dr. F. Creighton Wellman*).

The unusual hairiness of the under side of the front tarsi, in conjunction with the sharply defined light wing-markings (which, when the wings are viewed against a dark background, contrast strongly with the ground-colour), and the presence of only a single pale band on the hind tibiæ, affords a convenient means for the recognition of this species.

Hæmatopota pallidimarginata, sp. n.

♀.—Length (10 specimens) 6 to 9·2 mm.; width of head 2 to 3 mm.; width of front at vertex just under 1 to 1·2 mm.; length of wing 6·4 to 9·25 mm.

Dark brown or clove-brown species, with conspicuous pale hind margins to the abdominal segments and dark brown strongly marked wings.—*Dorsum of thorax with usual grey longitudinal stripes; light markings in wings clearly defined and rather coarse, usual three rosettes present, apical sinuous mark in some specimens distinctly bifurcate, but outer ramus often reduced to one or two ill-defined light spots; legs dark brown to clove-brown, femora greyish clove-brown, tibiae with dull cinnamon-coloured bands, often indistinct, especially on front tibiae, latter with a single narrow and more or less ill-defined band close to base, middle and hind tibiae each with two bands.*

Head: front rather broad, dark brown, its sides diverging below, in well-preserved specimens extreme lateral margins and an edging surrounding lateral frontal spots light grey, a darker brown partly divided median blotch sometimes distinguishable on flattened upper border of vertex; face and jowls light grey, area between lower inner margin of eye and antenna on each side more or less brownish or speckled with brown; *frontal callus* dark sepia, moderately deep, especially on each side, extending from eye to eye, but upper lateral angles rounded off, upper margin more or less excavated on each side of middle line, lower margin excavated above antennæ; a small clove-brown spot often but not always distinguishable in middle line below callus and above antennæ; lateral frontal spots usually large, conspicuous, clove-brown, and in contact with eyes, sometimes transversely elongate, median frontal spot apparently wanting; *palpi* isabella-coloured or mouse-grey, clothed on outer side with black or blackish hair, terminal joint moderately elongate; first and second joints of *antennæ* Vandyke-brown, first joint short and not incrassate, slightly greyish pollinose, upper angle of second joint moderately produced, third joint clove-brown, slightly lighter at extreme base, basal portion but little expanded, of nearly uniform depth and barely half as deep again as last three annuli, latter short and deep, conspicuously flattened from side to side, terminal annulus blunt at tip, scarcely as long as two preceding annuli taken together. *Thorax:* dorsum with extremely slender yellowish grey median stripe, which reaches hind margin, and a continuation of which is sometimes visible on scutellum;

admedian stripes light grey, interrupted before reaching transverse suture and disappearing altogether after usual triangular expansions behind latter; crescentic marks on hind margin of dorsum light grey, conspicuous, their inner limbs broad; on each side of dorsum are following additional light grey markings—a blotch on humeral callus and another immediately behind it, a fleck behind praesutural depression, another above postalar callus, and a spot at side of base of scutellum (these light grey thoracic markings are more or less indistinguishable in the case of rubbed specimens); scutellum sometimes with a median yellowish grey longitudinal mark, expanding posteriorly; pectus and pleura mouse-grey. *Abdomen*: hind borders of segments of venter as well as of dorsum smoke-grey or yellowish grey, on dorsum of second and two or three following segments hind border sometimes broadening into a somewhat triangular expansion in middle, lateral margins of first four segments often occupied by an expansion of the grey hind borders; venter somewhat greyish pollinose, clothed with minute, appressed, yellowish hairs; in one specimen in the Museum series third and three following segments each exhibit on dorsum a pair of more or less distinct grey admedian spots and also an indication of a grey median stripe. *Wings*: hind margin usually with a series of light blotches in distal marginal angles of posterior cells, blotch in distal marginal angle of fourth posterior cell generally smaller than others or absent altogether; a larger or smaller light blotch also present in distal extremity of axillary cell, and sometimes extending into proximal marginal angle of fifth posterior cell; oblique marks across posterior cells and markings in basal, anal, and axillary cells all of normal type, a larger or smaller double spot on sixth longitudinal vein beyond zigzag mark, latter not connected with basal loop in axillary cell; discal cell usually with two transverse light marks in middle third (more distal of two sometimes interrupted), and a small and often scarcely visible light fleck near distal extremity; *stigma* dark brown, well defined, and moderately elongate, beneath it a well defined dark brown blotch, which tapers downwards until it meets discal cell; pale fleck next costa at proximal end of stigma very small and inconspicuous, but light loop (upper extremity of distal rosette) in marginal cell beyond stigma well developed. *Halteres*: knob dark brown above and below, stalk and periphery of knob cream-buff. *Legs*: middle and hind tibiae not, front tibiae very slightly or scarcely incrassate; basal two-thirds or three-

fourths of first joint of middle and hind tarsi dull ochraceous buff, first joint of front tarsi sometimes faintly lighter (chestnut) at base.

Angola: type and five other specimens from either Bailundo or Kwanjulula, November to December 1904 (Dr. F. Creighton Wellman); two additional specimens from Bailundo, April 1905, "taken at a point about 175 miles south-west of the most easterly locality at which the previous examples of this species were found" (Dr. F. C. Wellman); two specimens from Benguella, June 1905 (Dr. F. C. Wellman). Concerning the first series met with the collector's field-note is as follows:—"About 70 specimens taken in small plains covered with tall grass, 230 to 310 miles from coast. Sluggish." The ten specimens of this species just enumerated exhibit a somewhat remarkable range in size; since one of the examples taken in April is considerably smaller than the rest of Dr. Wellman's series, while those collected in November and December are larger than the others, there may perhaps be some seasonal explanation of the phenomenon.

Hæmatopota pallidimarginata is not closely allied to any other species at present known to me, and its general dark coloration, combined with the conspicuously banded abdomen and inconspicuously banded tibiæ, should enable it to be recognized without difficulty.

Hæmatopota desidiosa, sp. n.

♀.—Length (1 specimen) 8 mm.; width of head 2·5 mm.; width of front at vertex 1 mm.; length of wing 8·25 mm.

Dark sepia; dorsum of thorax with usual three light grey or smoke-grey longitudinal stripes; dorsum of abdomen with extreme hind margins of all segments narrowly cream-coloured, second and following segments each with a pair of ill-defined yellowish grey spots, which are widely separated and on several segments more or less confluent with the yellowish grey lateral borders; wings mouse-grey, light markings distinct and sharply defined, usual three rosettes present, apical sinuous mark, at least in typical specimen, unusually widely separated from distal rosette; legs dark brown, femora greyish pollinose, middle femora greyish cinnamon, a single ill-defined band close to base of front tibiæ and two ill-defined bands on middle and hind tibiæ respectively cinnamon.

Head: front mouse-grey, extreme lateral margins and a narrow border surrounding each lateral frontal spot light

yellowish grey, vertex with a light grey spot on each side; face and jowls light grey, area between lower inner margin of eye and antenna on each side speckled with brown; lateral frontal spots clove-brown, conspicuous, narrowly separated from eyes, median frontal spot fairly distinct; *frontal callus* clove-brown, of moderate depth, extending from eye to eye, upper margin somewhat convex, lower margin slightly excavated above antennæ; a small triangular clove-brown median spot below callus; *palpi* isabella-coloured, terminal joint small and tapering, clothed on outer side with rough black hair and on under side of basal half with whitish hair; *antennæ* russet-brown, terminal joint darker on outer side, its last three annuli clove-brown, first joint greyish pollinose, small and short, scarcely incrassate though its inner margin convex when viewed from above, upper angle of second joint not produced, third joint not conspicuously elongate, basal half of its basal portion but little expanded, last annulus about equal in length to two preceding annuli taken together. *Thorax*: markings on dorsum difficult to distinguish in type, but all three longitudinal stripes apparently entire, usual expansion of admedian stripes immediately behind transverse suture scarcely noticeable, crescentic marks on hind margin faintly indicated, yellowish grey; pectus, pleuræ, and sides of dorsum smoke-grey; scutellum with light grey area on each side, at base of lateral border. *Abdomen*: dorsum pearl-grey on sides of first two segments; yellowish grey spots on dorsum scarcely visible when viewed directly from above, most distinct when regarded at a low angle from behind; from certain angles dorsum appears entirely yellowish grey pollinose; dorsum clothed as regards its median area with minute appressed brownish, and towards sides with yellowish hairs; venter mouse-grey, clothed with minute appressed yellowish hairs, extreme hind margins of second and following segments narrowly cream-coloured. *Wings*: apical sinuous mark widely interrupted in second submarginal cell; hind margin in type with a series of light flecks, situated respectively in distal marginal angles of second and third posterior cells, and in both marginal angles of fifth posterior cell; in typical specimen there is also a small light fleck in distal extremity of axillary cell, and a scarcely visible one in distal marginal angle of fourth posterior cell; some of usual oblique markings across posterior cells interrupted or partly interrupted; light markings in basal, anal, and axillary cells normal, a very small light fleck on sixth longitudinal vein beyond zigzag mark, latter in case of type indistinctly connected with basal loop in axillary cell by a

partly incomplete light border to anal angle; discal cell with two transverse light marks (the more distal one interrupted) across middle third, and a small and rather indistinct light fleck close to distal extremity; *stigma* mummy-brown, well marked and elongate, dark blotch below it not darker than ground-colour; at proximal end of stigma a distinct light mark (process from proximal rosette) running up to costa, and a small light loop (upper extremity of distal rosette) in marginal cell immediately beyond stigma. *Halteres*: stalk cream-coloured, knob dark sepia. *Legs*: front tibiæ scarcely, middle and hind tibiæ not incrassate; basal half or three-fourths of first joint and extreme base of second and third joints of middle and hind tarsi cinnamon.

Angola: Benguella, November–December 1904, from the same locality as the following species (Dr. F. Creighton Wellman).

Hæmatopota desidiosa is a dusky, although not *very* dark species, without conspicuous markings on the body; the coloration of the antennæ, simple apical sinuous mark in the wing, widely separated from the distal rosette, and obscurely banded tibiæ will help to distinguish it.

Hæmatopota molesta, sp. n.

♀.—Length (3 specimens) 8·25 to 9·5 mm.; width of head 2·25 to 2·5 mm.; width of front at vertex 1 mm.; length of wing 7·4 to 7·8 mm.

Dorsum of thorax dark olive-brown, with sides and usual three longitudinal stripes grey; dorsum of abdomen olive-brown, sides of segments more or less olive-grey, third and following segments each usually with a pair of more or less distinct though not sharply defined yellowish grey or grey admedian spots, often fused or partially fused with the grey lateral borders, of which they form an extension towards the middle line; wings sepia, light markings with a faint yellowish tinge, usual three rosettes present, rather coarse and sometimes largely fused together, apical sinuous mark slender, not bifurcate; legs dark brown, bands on tibiæ often hardly distinguishable, front tibiæ slightly lighter (mummy-brown) close to base, but scarcely banded, middle and hind tibiæ each with a pair of dull cinnamon bands, sometimes obsolete or nearly so in case of hind tibiæ.

Head: front olive-grey, an olive-brown roughly triangular spot on vertex on each side of middle line, face and jowls light grey; lateral frontal clove-brown spots conspicuous, narrowly separated from eyes, median frontal spot fairly

well marked; *frontal callus* clove-brown, rather narrow from above downwards, extending from eye to eye, upper margin nearly straight, lower margin excavated above antennæ; a small and not very conspicuous seal-brown spot in middle line below callus; *palpi* smoke-grey or drab, terminal joint fairly stout, clothed on outer side with rather rough-looking blackish hair, sometimes, especially below, interspersed with yellowish hair; *antennæ* dark brown, first joint greyish pollinose, short and slightly swollen, its inner margin convex; second joint with upper angle somewhat produced, third joint with basal portion but little expanded, tapering towards tip, terminal annulus equal in length to two preceding annuli taken together. *Thorax*: longitudinal grey stripes on dorsum not very conspicuous, median stripe apparently entire, admedian stripes expanding beyond transverse suture and then disappearing; pectus, pleuræ, and crescentic marks on hind margin of dorsum smoke-grey; dorsum of thorax and abdomen clothed with minute, appressed, deciduous, straw-yellow hairs. *Abdomen*: extreme hind margins of segments of dorsum, except last or last two, sometimes narrowly cream-buff; olive-brown area of dorsum sometimes reduced to a narrow median longitudinal stripe, remainder of each segment being yellowish grey; venter clothed like dorsum with appressed straw-yellow hairs, yellowish grey, with more or less conspicuous dark olive-brown longitudinal stripe. *Wings*: usual series of oblique marks across posterior cells distinct; light markings at each extremity of both basal cells coarse; divided light spot on sixth longitudinal vein beyond zigzag mark variable in size, sometimes large, sometimes scarcely visible; in axillary cell zigzag mark and basal loop coarse, former curving obliquely towards latter and sometimes joining it; discal cell with a coarse transverse light mark at each extremity of middle third, and an additional light mark close to each end, these marks often more or less fused together; *stigma* sepia, elongate and very conspicuous; a small light fleck next costa in apex of second costal cell above proximal extremity of stigma, *not connected with proximal rosette*; a more or less well-marked light loop, sometimes almost a complete circle, in marginal cell beyond distal extremity of stigma; alula for most part pale, sometimes slightly infuscated towards centre. *Halteres* cream-buff, knob seal-brown at base above and below. *Legs*: front tibiae slightly incrassate distally, middle and hind tibiae not incrassate; basal two-thirds or three-fourths of first joint of middle and hind tarsi, and extreme base of second and third joints of hind tarsi, dull cinnamon or buff.

Angola: three specimens (co-types) from Benguella, November–December 1904 (Dr. F. Creighton Wellman). The collector writes with reference to this species:—"Six specimens taken in thick bush, 125 miles from coast."

Hæmatopota molestus is not closely allied to any other species at present known to me. From *H. inflaticornis*, Austen (the original series of which was taken by Dr. Creighton Wellman in Bihé, Angola, 175 miles further from the coast, at about the same time as the specimens of *H. molestus*, and to which the latter presents a certain slight resemblance owing to the abdominal markings), the new species may at once be distinguished, *inter alia*, by the much narrower head and narrower abdomen, much smaller, shorter, and less swollen first joint of the antennæ, darker wings, much larger and more conspicuous stigma, and obscurely banded tibiæ.

Hæmatopota virgatipennis, sp. n.

♀.—Length (3 specimens) 10·25 to 12 mm.; width of head 2·6 to 3 mm.; width of front at vertex 1 to 1·4 mm.; width across base of second segment of abdomen 2·25 to 2·6 mm.; width across base of seventh segment of abdomen 1 to 1·25 mm.; length of wing 8·5 to 9·5 mm.

Elongate species, with tapering abdomen, and a conspicuous pale longitudinal streak in middle of wing.—Dorsum of thorax dark olive-brown, with usual three longitudinal stripes olive-grey or yellowish grey; dorsum of abdomen yellowish grey, second and two following segments each with a pair of very conspicuous, backwardly directed, admedian dark sepia blotches; wings sepia, usual three rosettes present, but partly obscured by the pale longitudinal streak, which extends from either base or distal extremity of first basal cell to apical sinuous mark, where latter meets lower branch of third longitudinal vein; legs pale mummy-brown to cinnamon, front tibiae with a single more or less indistinct pale band close to base, middle and hind tibiæ each with two pale bands.

Head: front dark brown, lateral borders (which expand on vertex), a ring surrounding each lateral frontal spot, and a median stripe extending from median frontal spot to occiput yellowish grey or olive-grey; face and jowls light grey, a more or less distinct small dark spot below each antenna and sometimes indications of a horizontal dark brown streak between lower inner margin of eye and antenna on each side; lateral frontal clove-brown spots large, conspicuous, not in contact with eyes, median frontal spot small but distinct; frontal callus mummy-brown in centre, dark sepia at sides, of moderate depth or somewhat narrow from

above downwards, extending from eye to eye, upper margin raised into an angle in middle, somewhat concave on each side of median line, lower margin very close to antennæ, above which it is excavated; a small but distinct clove-brown spot in middle line below callus; *eyes* in life with four horizontal dark bands; *palpi* ochraceous buff or sometimes isabella-coloured, terminal joint elongate, but not attenuate, clothed on outer side with short black hairs; *antennæ* russet-brown, last three annuli of last joint dark brown or clove-brown, first joint short and small, not incrassate, upper angle of second joint not produced, third joint narrow, scarcely wider at base. *Thorax*: dorsum with median grey stripe narrow and entire, admedian stripes interrupted or more or less indistinct after usual expansion behind transverse suture, crescentic marks on hind margin present; pectus, pleuræ, and sides of dorsum yellowish grey or smoke-grey, a more or less distinct horizontal dark brown streak on dorso-lumeral region immediately above dorso-pleural suture; scutellum yellowish grey or olive-grey, on dorsum with a pair of admedian olive-brown blotches, distal extremities of which extend on to hind margin. *Abdomen*: median area of dorsum of first segment except hind margin olive-brown; dark sepia blotches on second, third, and fourth segments somewhat tapering, not reaching hind margins, with their bases resting on front margins of segments and their inner borders slightly curved, so that on each segment there is a narrow, elongate, yellowish grey median triangle with its base resting on hind margin; fifth and sixth segments each with a pair of similar but less distinct dark sepia admedian blotches; on seventh segment the blotches, if present, are fused together, so that dorsum of this segment then appears almost wholly dark sepia; on fifth and following segments each dark sepia blotch is usually marked with a more or less distinct yellowish grey fleck; venter yellowish grey, with a more or less distinct dark brown longitudinal median stripe, extreme hind margins of segments for most part paler (cream-buff). *Wings*: pale longitudinal streak occupies first posterior cell with exception of distal portion, it is very sharply defined and is limited above by third longitudinal vein, from about level of distal extremity of discal cell onwards its lower margin diverges from fourth longitudinal vein; first basal cell also either entirely or almost entirely pale, second basal cell with coarse double light marking at each extremity, the two pairs of markings sometimes connected by a light bar immediately below fourth longitudinal vein; apical sinuous mark small and inconspicuous, interrupted on upper branch of third

longitudinal vein, portion of apical mark between second longitudinal and upper branch of third longitudinal vein further from apex of wing than lower portion; usual series of oblique marks across posterior cells small and inconspicuous, sometimes more or less broken up into spots; faint traces of light blotches sometimes visible on hind margin, in marginal angles of certain posterior cells; light blotch on sixth longitudinal vein beyond zigzag mark usually large and conspicuous; light loop at base of axillary cell and zigzag mark connected along sixth longitudinal vein by a broad light bar, proximal extremity of which extends across anal cell to fifth longitudinal vein; discal cell with a coarse curved light mark at proximal and two transverse light marks (sometimes joined into a roughly shaped ring) at distal extremity; costal cells pale ochraceous buff; *stigma* mummy-brown, of moderate length, its proximal extremity ochraceous buff; marginal cell beyond stigma with a well-marked light loop, in addition to which there is a transverse light mark near distal extremity of marginal cell; alula with a dark centre surrounded by a pale border. *Halteres* cream-buff or cream-coloured, knob sometimes brownish at base above and below. *Legs*: tibiæ not incrassate; tarsi dark brown towards tips, first joint of middle and hind tarsi except tip cream-buff.

Angola: type and two other specimens from Benguela, November-December 1904, "four specimens in thin bush" (*Dr. F. Creighton Wellman*).

This well-marked species is readily distinguishable by its wing-markings from any of its congeners at present known to me; the narrow tapering abdomen, with the conspicuous dark brown blotches on the dorsum, also serves to give the species a distinctive character.

Haematopota hostilis, sp. n.

♀.—Length (2 specimens) 8·3 mm.; width of head 2·5 to 2·6 mm.; width of front at vertex 1 mm. to just over 1 mm.; length of wing 8·25 mm.

Basal portion of third joint of antennæ ochraceous rufous; dorsum of thorax olive, usual three longitudinal stripes yellowish grey, indistinct; dorsum of abdomen yellowish grey, without distinct spots, hind margins of segments paler, second and following segments each with an olive-brown area in middle, which, except in case of last segment, is more or less distinctly divided by a yellowish grey median longitudinal stripe; wings pale sepia, light markings of normal type and clearly defined; legs cinnamon, front tibiæ sometimes with a faint indication of a pale band on basal third, middle and hind

tibiae each with two pale bands, which may be so faint as to be indistinguishable.

Head: front mouse-grey; extreme lateral margins, a ring surrounding each lateral frontal spot, and sometimes a narrow median stripe running up to vertex from median frontal spot yellowish grey or light grey; face and jowls smoke-grey, space between antenna and lower inner margin of eye on each side more or less speckled with dark brown or with a more or less distinct dark brown horizontal streak; clove-brown lateral frontal spots of small or moderate size, not in contact with eyes, median frontal spot small and inconspicuous or obsolete; *frontal callus* tawny olive to dark sepia, rather narrow from above downwards, extending from eye to eye, but upper angles sometimes rounded off, upper and lower margins straight or nearly so; a small and inconspicuous Vandijke-brown spot in middle line below callus; *palpi* isabella-coloured, terminal joint moderately stout, clothed on outer side with black hairs; first and second joints of *antennæ* pale cinnamon, first joint short and small, not or scarcely incrassate, greyish pollinose and clothed with black hairs above, upper angle of second joint very slightly produced, basal portion of third joint of moderate breadth, tapering but not markedly elongate, last three annuli darker, terminal annulus clove-brown, two preceding annuli burnt-umber coloured. *Thorax*: dorsum (including scutellum) clothed with short, yellowish, deciduous hairs; pectus and pleuræ smoke-grey or drab-grey; scutellum with hind border and an ill-defined median stripe yellowish grey. *Abdomen*: dorsum clothed with short, appressed, pale buff-yellow hairs; olive-brown area in middle of second segment much broader than corresponding areas on subsequent segments, on which, however, an offshoot from median area extends outwards parallel with and in front of hind margin; venter yellowish grey pollinose, hairy covering as on dorsum, hind margins of segments except first cream-buff, traces of an ill-defined dark median longitudinal stripe, interrupted on hind borders of segments, sometimes distinguishable. *Wings*: usual three rosettes present, their outlines sometimes consisting of very fine lines, each rosette, apart from two or three light flecks towards centre, and in case of proximal rosette three light blotches occupying base of first submarginal and first posterior cells and apex of first basal cell respectively, composed of a single series of markings; apical sinuous mark simple and apparently obsolescent, widely interrupted in second submarginal cell; usual series of oblique marks across posterior cells distinct, marks in first three posterior cells each

divided into two spots; hind margin with more or less distinct light blotches in distal marginal angles of second, third, and fifth posterior cells, and sometimes with additional light blotches in proximal marginal angle of fifth posterior cell and elsewhere; light blotch on sixth longitudinal vein beyond zigzag mark obsolete or very small and indistinct; in axillary cell zigzag mark and basal light loop not connected; light markings in basal cells of normal type; discal cell with two transverse light marks across middle third and a third light fleck (sometimes very small) near distal extremity; *stigma* of moderate length, pale mummy-brown, its proximal extremity tawny olive, but no distinct light mark running up from proximal rosette to costa; marginal cell with a well-defined oval light loop at distal end of stigma. *Halteres*: knob seal-brown, outer margin cream-buff, stalk cream-coloured. *Legs*: neither front nor hind tibiæ incrassate; front tarsi, tips of front tibiæ and of joints of middle and hind tarsi mummy-brown, basal two-thirds of first joint of middle and hind tarsi tawny olive.

Angola: type and one other specimen from the vicinity of the Keve River, Benguella, November–December 1904 (received from Dr. F. Creighton Wellman).

Hæmatopota hostilis must not be confused with *H. brevicornis*, Austen, the typical series of which was also obtained by Dr. Creighton Wellman in Benguella, and to which it presents some slight resemblance; the new species may be distinguished, *inter alia*, by the longer and more slender antennæ, the absence of spots on the abdomen, and the much greater fineness of the wing-markings, which are also more restricted in extent.

Hæmatopota tenuicrus, sp. n.

♀.—Length (1 specimen) 7·5 mm.; width of head just over 2 mm.; width of front at vertex 0·8 mm.; length of wing 7 mm.

Mummy-brown, abdomen dark brown; on dorsum of thorax the sides and three conspicuous parallel longitudinal stripes yellowish grey; dorsum of abdomen with hind margin and sides of each segment yellowish pollinose; wings sepia, light markings distinct and rather fine, usual three rosettes present, a broad dull light curved transverse streak close to tip of wing beyond apical sinuous mark, and a series of large dull light blotches on hind margin (in distal marginal angles of all posterior cells and at distal extremity of axillary cell); legs light mummy-brown, tibiæ without bands and not incrassate.

Head: front light mummy-brown, with usual darker

quadrate blotch on vertex divided by narrow median grey stripe and not extending to sides, extreme lateral margins of front and an area next eye below each lateral frontal spot light grey; face and jowls smoke-grey, a dark seal-brown elongate mark on upper part of face between eye and antenna on each side, but not in contact with eye; clove-brown lateral frontal spots distinct, ovate, extending downwards and inwards, almost reaching frontal callus below and above each in contact with eye by means of a narrow horizontal pedicel, median frontal spot wanting in case of type; *frontal callus* tawny olive, rather narrow from above downwards, extending from eye to eye, but upper angles rounded off, upper margin nearly straight, lower margin excavated above antennæ; a small seal-brown spot or double spot in middle line below callus; *palpi* brownish isabella-coloured, terminal joint moderately elongate but rather blunt at tip, clothed on outer side with black hairs; *first joint of antennæ* cinnamon, greyish pollinose, *very short*, distinctly incrassate when viewed from above, second joint somewhat paler, its upper angle not conspicuously produced, third joint wanting in case of type. *Thorax*: three *stripes on dorsum* entire and *parallel* instead of converging posteriorly, median stripe behind transverse suture much narrower than admedian stripes, usual crescentic marks on hind margin indistinguishable in type; pleuræ yellowish grey; scutellum with median stripe and a patch at base on each side yellowish grey. *Abdomen*: dorsum with a pair of orange-buff pollinose admedian spots on third and each following segment, in contact with hind margin and tending to become fused with lateral yellowish pollinose patches; venter with posterior angles and extreme hind margins of segments yellowish pollinose. *Wings*: rosettes simple, their borders not broken up into spots; discal cell in type with a transverse light mark at end of proximal and another at commencement of distal third, and also with a small and duller light fleck at each extremity; in axillary cell zigzag mark and basal loop not distinctly connected, light blotch on sixth longitudinal vein beyond zigzag mark almost or quite obsolete; usual series of oblique light marks across posterior cells sharply defined; light marks in basal cells of normal type; *stigma* mummy-brown, long, and well marked, no light mark running up to costa at its proximal extremity; usual light loop (upper portion of distal rosette) in marginal cell beyond stigma in case of type represented merely by two small light flecks. *Halteres*: knob Vandyke-brown, stalk cream-buff. *Legs*: middle and hind tarsi pale cinnamon.

Northern Nigeria : Akwatcha, Bassa Province, June 1906
(Dr. G. J. Pirie).

Although on a cursory inspection *Hematopota tenuicrus* might possibly be mistaken for a pale form of *H. lacessens*, Austen, which also occurs in Northern Nigeria, it is, apart from other characters, easily distinguishable owing to the non-incrassate front tibiae ; the fact that the thoracic stripes remain parallel instead of, as is usually the case, converging posteriorly will also serve as a means of distinguishing the present species.

XXXIII.—*On Mammals from the Malay Peninsula and Islands.* By OLDFIELD THOMAS.

THE British Museum owes to Mr. Herbert C. Robinson, of Selangor, a further fine collection of Malayan mammals, mostly collected by him during an exploration of the high ground separating the States of Selangor and Pahang. During their determination I have made the following notes, both on them and on other Malayan mammals in the Museum collection.

Sympalangus syndactylus continentis, subsp. n.

While the Siamang is common in Sumatra, it is rare on the Malay Peninsula, and but few specimens have ever been sent home for examination. One was received from Mr. Robinson in 1906 and is referred to in Mr. Bonhote's account of the Mammals of the Gunong Tahan Expedition *, and now another comes from the Semangko Pass, Selangor-Pahang Boundary. Both are fine old males, and have afforded me a good opportunity of comparing the Malay form with that found in the Island of Sumatra. The result is that the Malay form proves to be slightly different from the Sumatran one, and may be diagnosed as follows :—

External characters quite as in true *syndactylus*, except that the size, in agreement with the skulls, will no doubt prove to be rather less.

Skull smaller and more lightly built than in *syndactylus*. Face lower, the orbits smaller and rather less heavily ridged. Muzzle markedly less projecting when viewed from above. Nasal opening decidedly narrower. Tooth-row shorter. Mandible slenderer, its height below the molars less than in *syndactylus*.

* *Journ. Fed. Mal. States Mus.* iii. p. 1 (1908).

Dimensions of the type (measured in the flesh) :—

Head and body 846 mm.; hind foot 164; ear 34.

Skull*: greatest length 127; basal length 93·5; condylo-basal length 103; zygomatic breadth 89; nasal opening 21 x 14; external orbital breadth 71·5; intertemporal breadth 43·5; mastoid breadth 77; front of canine to back of m^1 41·2.

Hab. Malay Peninsula. Type from the Semangko Pass, Selangor-Pahang Boundary; alt. 3000'.

Type. Old male. B.M. no. 8. 7. 20. 1. Original number 564. Collected 26 January, 1908, by Mr. H. C. Robinson.

GALEOPTERUS.

The receipt of a fine series of the Javan *Galeopterus* presented to the Museum by Mr. W. E. Balston, the loan of the typical skull of *G. undatus*, Wagner, from the Munich Museum, and the receipt of the Malay *Galeopteri* from Mr. Robinson have afforded me the opportunity of re-examining the members of this genus occurring in the Malay Peninsula, Java, and Borneo.

In the first place, I find that the Javan species, which I provisionally called *G. undatus* in my previous paper, may bear the name of *G. variegatus*, Geoff., on the ground that although no definite locality was given in the original description, nor in that by Desmarest in 1820, yet the animal was so distinctly stated to be from Java in Geoffroy's 1829 paper that, in the absence of any discordant character, this may be accepted as fixing the type locality. The fact that such fixing was done by the original author himself may be taken as indicating that he had received evidence as to the locality of his species, or even that he had found out the true locality of his original type specimen.

Under these circumstances I propose to accept the name of *G. variegatus* for the Javan species.

In a general way this species is characterized by its comparatively dark colour, large size, large teeth, and the almost entire absence of sexual difference in size. The skulls before me are ten in number, all fully adult, besides some young ones, and they are all remarkably uniform in size, 75-76 mm. in condylo-basal length, this range including seven males and the largest female; while one female is only 72 mm. in

* These measures may be compared with those of an adult male skull of *syndactylus* given by Mr. Miller, Smiths. Misc. Coll. xlv. p. 70 (1908), remembering that Mr. Miller's "basal length" is what is now known as condylo-basal length, and his "basilar length" as basal length.

length. In other species the female averages markedly larger than the male, but here we have the smallest specimen of the female sex.

With regard to *G. undatus*, of which the type skull has been courteously lent me by the authorities of the Munich Museum, I find that it cannot be referred to *G. variegatus*, as it is still larger, being the largest *Galeopterus* skull on record, with a condylo-basal length of no less than 82·5 mm. Its exact locality remains to be discovered.

Then with regard to the smaller smaller-toothed Malayan and Bornean forms, I am still unable to find any difference between the latter and a specimen from the Natuna Islands, representing *G. natunæ*, Mill. Possibly *G. gracilis*, Mill., from Sirhassen will also prove to be the same.

But the additional material from the Malay Peninsula indicates that the form found there is constantly larger, and since no name appears to be applicable to it, I would suggest that of

Galeopterus peninsulae, sp. n.

General colour in the grey phase pale, as in Sumatran and Bornean specimens, decidedly paler than in *G. variegatus*.

Skull, while smaller than in *G. undatus*, *variegatus*, and *temminckii*, averaging decidedly larger than in the Bornean and Natuna forms, and with the same marked sexual difference in favour of the female.

Dimensions of the male (measured in flesh) :—

Head and body 345 mm.; tail 271; hind foot 65; ear 21. The measurements of the typical female were not taken.

Skulls :—		♂.	♀ (type).
		mm.	mm.
Condylo-basal length	68	72·5	
Greatest breadth	46	50·4	
Interorbital breadth	18·2	22·3	
Breadth of brain-case	26	25·7	
Palatal length	38	35·5	
Length of upper tooth-row	35·5	37	
Three upper molars	10·2	11·1	

Hab. Malay Peninsula. Type from the Semangko Pass, Selangor-Pahang Boundary.

Type. Adult female. B.M. no. 8. 7. 20. 10. Original number 632. Collected 23 February, 1908, by H. C. Robinson. Presented by the Selangor Museum.

Sciuropterus genibarbis, Horsf.

On extracting the skull of the type specimen of this species, from Java, I find that it is by no means quite like those in

the Museum collection from the Malay Peninsula and Borneo, each of these latter having distinctive characters of their own. The true *S. genibarbis* has long narrow nasals, a very narrow interorbital region, and a much narrower palate than any of the other specimens in the Museum.

Externally all are closely similar, though the type is so faded that the Javan form may possess colour-characters which will only be perceptible on fresh specimens. By the skulls, however, the two following races may be distinguished :—

Sciuropterus genibarbis malaccanus, subsp. n.

Size and other essential characters as in true *S. genibarbis*, but the nasals markedly shorter and broader, the teeth heavier, and the palate broader.

General colour above rich chestnut, greyer on the head and fore-quarters. Under surface clay-colour. Tail dark brown above, more rufous below.

Dimensions of the type (measured in skin) :—

Head and body (stretched); tail 190 mm.; hind foot 30.

Skull: basilar length (c.) 32·5; greatest breadth 25; nasals, length 10, greatest breadth 6·4, breadth posteriorly 4·2; breadth of brain-case 18·7; palatilar length 17·3; breadth of palate outside m^1 9·3; length of upper tooth-series exclusive of p^3 7·4.

Lab. Malacca.

Type. Adult female. B.M. no. 60.5.4.83. Collected by Dr. T. Cantor. Presented by the East India Company. Two specimens.

The broad short nasals are the most marked characteristic of this form.

Sciuropterus genibarbis borneensis, subsp. n.

Like true *genibarbis* in the shape of the nasals, but the interorbital region and palate broad, as in *malaccanus*, markedly broader than in the Javan form.

Colour as in *malaccanus*, or (as, for example, in the type) rather paler, the posterior dorsal colour approaching Ridgway's "vinaceous cinnamon."

Dimensions of the type (measured in skin) :—

Head and body 190 mm.; tail 160; hind foot 32.

Skull: basilar length (c.) 32; greatest breadth 24·8; nasals, length 9·4, greatest breadth 4·6, posterior breadth 3·5; interorbital breadth 8; breadth of brain-case 19; palatilar length 17·3; breadth of palate inclusive of m^1 9·5; length of upper tooth-series exclusive of p^3 7·6.

Hab. Northern Borneo. Type from the Bakong River, Baram, E. Sarawak.

Type. Adult male. B.M. no. 99. 12. 9. 35. Collected 7 May, 1893, and presented by Dr. Charles Hose. Four Bornean specimens examined.

* *Sciuropterus (Hylopetes) belone*, sp. n.

Most closely allied to *S. aurantiacus* and *S. spadiceus*. Colour as in all the members of the *sagitta* group, blackish slaty above, broadly washed with fulvous on the head and back; the under surface white to the bases of the hairs anteriorly and down the middle line of the belly, grey-based with buffy tips on the sides of the belly and inner sides of the hind limbs. Tail dark brown above and below, its middle layer buffy; the midrib below buffy proximally, dark brown terminally; the tail is about as long as in *aurantiacus*, longer than in *spadiceus*.

Skull very similar to that of *S. aurantiacus*, of which the type is now in the British Museum, but with the nasals longer and more narrowed behind, the teeth broader, and the bullæ less inflated vertically, but longer horizontally. As compared with that of *S. spadiceus*, the nasals do not project backwards beyond the frontal processes of the premaxillæ, and the teeth are very markedly broader.

Dimensions of the type (measured in the flesh) :—

Head and body 138 mm.; tail 136; hind foot 26; ear 22.

Skull: greatest length 35; basilar length 27·5; greatest breadth 22·3; nasals 10·2; palatilar length 15·6; horizontal length of bulla 10·2; length of upper tooth-series exclusive of p^3 6·8.

Hab. Pulo Terutau, Straits of Malacca.

Type. Old male. B.M. no. 8. 7. 20. 61. Original number 523. Collected 1 December, 1907. Presented by the Selangor Museum.

This will probably prove to be the small Flying Squirrel of the whole of the Malay Peninsula, but as yet members of this group are so rare that but few localities are represented.

Its two nearest allies are *S. spadiceus* from Arakan and *S. aurantiacus* from Banka, but it differs from the former by its longer tail and broader teeth, and from the latter by its narrower nasals and differently shaped bullæ. The remaining members of the group—*S. sagitta*, Linn. (*S. lepidus*, Horsf.), from Java, *S. everetti*, Thos., from the Natunas, and *S. harrisoni*, Stone, from Borneo—are all larger than *S. belone*.

Sciurus robinsoni alacris, subsp. n.

Very like *S. robinsoni*, Bonh.* in all essential respects, but the crown is suffused with buffy, owing to the presence of buffy subterminal rings on the hairs, the fore-back is almost as buffy as the hind-back, and the under surface is sharply defined white or creamy white instead of the buff or cream-buff, darkening almost to ochraceous buff on the inner side of the hind legs, characteristic of typical *robinsoni*. The upper surface is therefore more buffy, and the under surface less so than in the older-known form.

In the skull the bullæ (one specimen only perfect) are rather larger than in the type of *robinsoni*, and the incisors (of all four specimens) are a little more markedly thrown forward (less vertical), and their front surface is yellow instead of reddish orange.

Dimensions of the type (measured in the flesh) :—

Head and body 105 mm.; tail 92; hind foot 30; ear 12.

Skull: greatest length 34; basilar length 26; greatest breadth 20; upper tooth-series 6·2.

Hab. of type. Semangko Pass, Selangor-Pahang Boundary; alt. 3000'. Other specimens from Cheras and Ginting Bidei, Selangor.

Type. Adult male. B.M. no. 8. 7. 20. 43. Original number 613. Collected 24 February, 1908, by Mr. Herbert C. Robinson, and presented by the Selangor Museum. Four specimens examined.

This would appear to be a more southern race of *S. robinsoni*, which was discovered in 1901 by Mr. Robinson on Bukit Besar, a mountain on the Jalor-Nawnchik Boundary.

Laria insignis jalorensis, Bonh.

Two forms of *insignis* were described from the Malay Peninsula almost simultaneously by Bonhote † and Miller ‡, the one (*jalorensis*) greyish and the other (*peninsulæ*) a bright and comparatively fulvous animal.

Whether these are seasonal phases of one form, or are local races inhabiting respectively the high ground (*jalorensis*) and the low (*peninsulæ*), the material available is not sufficient to show.

The four adult specimens now received from the Semangko Pass, killed in February, are all of the true *jalorensis* type.

* *Fasciculi Malayenses*, Zool. i. p. 24 (1908).

† *Funambulus insignis jalorensis*, Bonhote, *Fasc. Malay.*, Zool. i. p. 25 (July 1908).

‡ *Funambulus peninsulæ*, Miller, *Smiths. Misc. Coll.* xlv. p. 25 (November 1908).

XXXIV.—*A new Jerboa from China.*

By OLDFIELD THOMAS.

HITHERTO the only Jerboa known from China has been the five-toed *Allactaga mongolica*, Radde (*A. annulata*, M.-Edw.), and it has therefore been with much interest that I have examined a three-toed species from Shensi, recently presented to the National Museum by Mr. A. de C. Sowerby. It proves to be a distinct form allied to *Dipus sagitta*, Pall., and may be characterized as follows:—

Dipus sowerbyi, sp. n.

Size considerably greater than in *D. sagitta* and its close ally *D. deasyi*, B. Ham. General colour sandy buff varying towards fawn, more or less darkened along the dorsal area. White lines on rump well defined, prominent. Head and ears like body. Outer side of legs, from knees to ankles, rich buffy, contrasting markedly with the pure white of their inner surfaces. Fore limbs, whole of under surface, and hind feet pure white, the long hairs under the toes slightly suffused with buffy; a narrow line under heel blackish. Tail buffy or pale fawn above, white below; the terminal half-inch white, the blackish band preceding it about three quarters of an inch in length.

Skull comparatively stout and heavy, its muzzle particularly broad, broader in proportion to the brain-case than in the other species. Thus the breadth of the muzzle halfway along the nasals is quite half the least interorbital breadth, considerably less than half in *D. deasyi* and *sagitta*. Bullæ larger than in *D. deasyi*, but of course not approaching their development in the genus *Jaculus*.

Dimensions of the type (measured in the flesh) :—

Head and body 116 mm.; tail 169; hind foot 65; ear 22.

Skull: greatest length 34·5; basilar length 25·8; greatest breadth 22; nasals 12·5; breadth of muzzle 5·2; interorbital breadth 10; breadth of brain-case 18·3; palatilar length 16·7; palatal foramina 5·7 × 3; length of upper tooth-row (molars only) 5·5.

Hab. Yu-lin-fu, Shensi, China. Alt. 4000'.

Type. Adult male. B.M. no. 8. 7. 31. 2. Original number 1790. Collected 29 April, 1908, and presented by Mr. Arthur de C. Sowerby. Two specimens.

Of the two specimens, both taken the same day, the younger, curiously enough, is much the brighter of the two, being nearly as bright a buffy as *D. sagitta*, while the older specimen (the type) is more drabbiy in tone.

The discovery of this Jerboa extends very greatly the known range of the three-toed Jerboas, which had hitherto not been recorded east of Central Asia.

This animal, with its close allies *D. sagitta* and *D. deasyi*, is clearly distinct generically from the other three-toed Jerboas, and in finding a name to use for it I have had to examine the generic nomenclature of the group with such care and completeness as to enable me to claim the position of "first reviser" in the selection of types for certain of the generic names.

The genera in question, with their characters and types, would appear to be as follows:—

JACULUS, Erxl., 1777. Type *Jaculus jaculus* (*Mus jaculus*, Linn.), the smaller Egyptian Jerboa.

Three hind toes. Three cheek-teeth only.

Type selected by tautonymy, "*Mus jaculus*" being placed as a synonym of *Jaculus orientalis*.

DIPUS, Zimm. * Geogr. Gesch. ii. p. 354 (1780). Type *Dipus sagitta* (*Mus sagitta*, Pall.).

Three hind toes. Four upper cheek-teeth.

The other species being exotic and otherwise unsuitable, the type of this name has obviously to be either *Mus jaculus*, Pallas (*nec* Linn.), the five-toed Russian Jerboa, or *M. sagitta*, Pall., the small three-toed species. Both elimination and expediency indicate that the latter should be selected as the type.

ALLACTAGA, F. Cuv. P. Z. S. 1836, p. 141. Type *Mus jaculus*, Pall.
Five-toed Jerboa.

SCIROPODA, Brandt, Bull. Ac. Pétersb. ii. p. 212 (1844). Type *Dipus mauritanicus*, Duv. (equal or closely allied to *Jaculus gerboa*, Oliv., the large Egyptian Jerboa).

HALTICUS, id. t. c. p. 213. Type *Dipus halicus*, Ill.

HALTOMYS, id. t. c. p. 215. Type *Dipus mauritanicus*, Duv.

None of Brandt's names standing for valid groups there is no need to explain in detail my selections of their respective types.

The other names in the group do not need any special examination.

Dipus, with its type *D. sagitta*, is therefore the proper name for the genus to which *D. sowerbyi* belongs. This genus is readily distinguishable from *Jaculus* both by the persistence of the small upper premolar, absent in *Jaculus*, and by the much less development of the bullæ, which do not surpass the occiput posteriorly. The molars also are slightly more complex.

* Zimmermann quotes Schreber's plates 228 and 229, and if these were really already published the name should date from them, but it would not alter the conclusions here come to. Sherborn puts down their date of publication as 1782, two years later than Zimmermann's book.

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XXXV.—*Rhynchotal Notes.*—XLV. By W. L. DISTANT.

HOMOPTERA.

Fam. Cercopidæ.

Ethiopian Genera and Species.

THE Ethiopian Cercopidæ are now becoming much better known to entomologists. Since Walker first described many species and Stål laid the foundation of the study in his 'Hemiptera Africana,' recent workers have paid considerable attention to the family. Among these contributors may be mentioned Schouteden, who described and enumerated a number of species principally from the Congo region (1901), and Jacobi, who did the same for the fauna of North-east Africa (1904). Lethierry, Karsch, Melichar, and the present writer have also, from time to time, added to the list. The British Museum contained a considerable quantity of unworked material, of which the collection made by Neave in North-west Rhodesia is particularly important, and that made by Escalera in the Cameroon district of West Africa has filled many lacunæ in the National Collection.

Subfam. *APHROPHORINAE.*Genus *PTYELUS.*

Ptyelus, St.-Farg. & Serv. Enc. Méth. x. p. 608 (1825).

Type, *P. flavesiensis*, Fabr.

Ptyelus combinatus, sp. n.

Body, legs, and tegmina black; a large central discal spot to vertex, a broad transverse fascia to pronotum situate a little before middle, head beneath (excluding extreme basal margin of face, which is widened into a spot between face and eyes, and the posterior margins of clypeus), and a large lateral spot near each anterior coxa, ochraceous or stramineous; wings pale fuliginous, with darker shadings; vertex short, broad, about half as long as breadth between the eyes, convexly rounded in front; face rather broadly centrally longitudinally flattened for more than half its length, the lateral areas transversely striate; rostrum reaching the intermediate coxae; posterior tibiae with two prominent spines, the one nearer base smallest; tegmina very thickly, finely, and obscurely punctate, more piceous than black, the posterior claval margin distinctly black.

Long., excl. tegm., 11 mm.; exp. tegm. 30 mm.

Hab. Cameroons (*Esculera*, Brit. Mus.).

Allied to *P. flavesiensis*, Fabr., by the short, broad, and convexly rounded vertex; by the fuliginous shading of the wings allied to *P. grossus*, Fabr.

Ptyelus escalerae, sp. n.

Body, legs, and tegmina pale ochraceous; four small spots at base of vertex in transverse series and two central spots before them, two central spots near anterior margin of pronotum, basal joints of antennae, a small spot near anterior coxae, apex of rostrum, a broad annulation to anterior tibiae, anterior and intermediate tarsi, and all the tarsal claws, black; tegmina with a small black discal spot before middle somewhat surrounded by a small cluster of testaceous suffusions; wings pale grey hyaline, concolorous, without darker suffusions; vertex about half the length of breadth between eyes, subangularly produced in front; face rather broadly, longitudinally, centrally flattened for more than half its length, the lateral areas transversely striate, rostrum reaching the intermediate coxae; pronotum very thickly and finely

punctate, with a central longitudinal carinate line which terminates near anterior margin in a slight foveation.

Long., excl. tegm., 12 mm.; exp. tegm. 32 mm.

Hab. Cameroons (*Escalera*, Brit. Mus.).

Allied to *P. grossus*, Fabr., but with the vertex a little more angulate anteriorly, while from all the varieties of the Fabrician species it differs by the pale unicolorous wings.

Genus POOPHILUS.

Poophilus, Stål, Hem. Afr. iv. p. 72 (1866).

Type, *P. actuosus*, Stål.

Poophilus adustus *.

Ptyelus adustus, Walk. List Hom. iii. p. 710 (1851).

Hab. Congo, Sierra Leone.

Poophilus obscurus

Ptyelus obscurus, Walk. List Hom. iii. p. 707 (1851).

Aphrophora obscura, Germ., MS.

Hab. S. Africa.

Genus SEPULLIA.

Sepullia, Stål, Hem. Afr. iv. p. 79 (1866).

Type, *S. murrayi*, Sign.

Sepullia murrayi.

Clastoptera murrayi, Sign. in Thoms. Arch. Ent. ii. p. 333 (1858).

Sepullia murrayi, Stål, Hem. Afr. iv. p. 80 (1866).

Var.—Head, pronotum, and tegmina stramineous, the latter with the veins, apical margin, and confluent spots on apical area black; scutellum black; body beneath and legs as in the typical form.

I possess both the black typical form and variety from Calabar, where they were collected by the late Mr. Rutherford.

Genus HEMIAPTERUS.

Hemipterus, Jacobi, Zool. Jahrb. xix. p. 777 (1904).

Type, *H. decurtatus*, Jacobi.

* The *P. congoensis*, Schout., which I have not seen, may be conspecific with this species.

Hemipterus fasciatus, sp. n.

Body above black; vertex in front of eyes, a central transverse fascia to pronotum, and a broader transverse fascia crossing tegmina at apex of scutellum and narrowing towards costal margin, greyish white; body beneath and legs black or piceous; face greyish white, the apex and transverse substriate lines black or piceous; disk of sternum ochraceous, bases of femora and the posterior tarsi ochraceous; rostrum passing the intermediate coxae, and excluding base, ochraceous; vertex a little shorter than pronotum, obtusely angularly produced, the ocelli a little nearer to each other than to eyes; vertex, pronotum, and scutellum finely wrinkled and granulose; scutellum slightly longer than broad; tegmina strongly convex, deflected on each side; face convex; posterior tibiae with two spines.

Long., incl. tegm., 5 mm.

Hab. Cameroons (*Escalera*, Brit. Mus.).

Hemipterus variegatus, sp. n.

Vertex, pronotum, and scutellum black or piceous; vertex in front of eyes pale obscure ochraceous; pronotum with a transverse greyish fascia; body beneath and legs piceous brown; face and cheeks stramineous, basal margin of face black, its disk with transverse substriate piceous-brown lines; sternum pale ochraceous; tegmina piceous brown, a narrow curved transverse fascia before middle and some spots on apical area greyish white; vertex shorter than pronotum, obtusely angularly produced in front; ocelli slightly nearer to each other than to eyes; pronotum with an obscure central, discal, longitudinal impressed line; vertex, pronotum, and scutellum finely wrinkled and granulose; scutellum slightly longer than broad; tegmina convex, deflected on each side; face moderately convex; clypeus with a central longitudinal ridge; posterior tibiae with two spines.

Long., incl. tegm., 4 $\frac{1}{2}$ mm.

Hab. Sierra Leone (*Jas. Foxcroft*, Brit. Mus.).

Subfam. *Coccoidea*.Genus **BANDUSIA**.

Bandusia, Stål, Illus. Afr. iv. p. 62 (1866).

Type, *B. rubicunda*, Walk.

Bandusia innotata.

Monecphora innotata, Walk. Ins. Saund., Hom. p. 87 (1858).

Hab. W. C. Africa.

Bandusia apicalis.

Literna? apicalis, Hagl. Öefv. Vet.-Ak. Förh. 1899, no. 2, p. 51.

Hab. Cameroons (*Escalera*, Brit. Mus.).

AMBERANA, gen. nov.

Vertex of head broader than long, obtusely angularly produced in front of eyes; face broadly longitudinally centrally sulcately impressed, the margins of this area ridged; pronotum almost as long as broad, convex, the anterior lateral margins straightly oblique to head, the posterior lateral margins oblique to basal angles of scutellum, anterior margin transversely straight, posterior margin only moderately concavely sinuate; scutellum longer than broad, discally foveately impressed; rostrum reaching the intermediate coxae; posterior tibiae with a prominent spine before apex; tegmina long, narrow, three times as long as broad, apices rounded, the apical area transversely veined; wings shorter than tegmina, a little more than twice as long as broad.

Type, *A. elongata*, Dist.

By the sulcately impressed face allied to *Literna*, Stål, from which, among other characters, it may be at once separated by the narrow elongated tegmina.

Amberana elongata, sp. n.

Vertex, pronotum, scutellum, head beneath, prosternum, and legs black; posterior legs with the femora and bases of tibiae ochraceous; abdomen above and beneath sanguineous; meso- and metasterna testaceous or reddish ochraceous; tegmina black, a large elongate basal spot in clavus, a subcostal rounded spot above its apex, and a large transverse spot before apical area, golden yellow; wings very pale fuliginous; structural characters as in generic diagnosis.

Long., excl. tegm., 8½ mm.; exp. tegm. 25 mm.

Hab. Madagascar; Mt. Amber (Brit. Mus.).

DAUPHINA, gen. nov.

Vertex of head a little broader than long, narrowing to apex, which is broadly subangularly rounded; ocelli somewhat contiguous, much nearer to each other than to eyes; face broad, broadly longitudinally sulcately impressed, the margins of this area ridged; pronotum almost twice as broad as long, the lateral angles subprominent and subangulate, the anterior lateral margins slightly rounded and obliquely directed to head, the posterior lateral margins obliquely sinuate to basal angles of scutellum, posterior margin concavely sinuate; scutellum longer than broad, discally foveately impressed; rostrum reaching the intermediate coxae; posterior tibiae with a strong spine before apex; tegmina but a little more than twice as long as broad, their apices rounded, transversely veined on apical area; wings a little shorter than tegmina, more than twice as long as broad.

Type, *D. lemuria*, Dist.

By the sulcately impressed face allied to *Literna*, Stål, but differing by the shape and size of the pronotum, &c.

Dauphina lemuria, sp. n.

Head and scutellum black; pronotum ochraceous, its anterior margin (broadly) and posterior margin (narrowly) black; abdomen above, body beneath, and legs sanguineous; face, anterior and intermediate tibiae and tarsi, and apices of the posterior tibiae and the tarsi black; lateral angles of the prosternum ochraceous, inwardly narrowly black; tegmina with less than basal half ochraceous, outwardly margined with a transverse black fascia inwardly continued on claval suture but not reaching base, base of posterior claval margin also black, the costal area sanguineous; beyond this ochraceous area the colour is pale brownish ochraceous, with the apical margin broadly black; wings very pale fuliginous, the basal area and posterior and apical margins fuscous; vertex foveate on each lateral area at inner margins of eyes; pronotum thickly finely obscurely punctate, with several foveations in the anterior black area; rostrum sanguineous, its apex black and reaching the intermediate coxae; posterior tibiae with a single robust spine at about one-third before apex.

Long., excl. tegm., 9 mm.; exp. tegm. 25 mm.

Hab. Madagascar; Fort Dauphin (*M. J. Cloisel*, Brit. Mus.).

Genus TRIECPHORA.

Triecphora, Amy. & Serv. Hist. Hém. p. 501 (1843); Dist. Insect. Transvaal, pt. ix, p. 225 (1908).

Tomaspis, Stål (nec Amy. & Serv.), Hem. Afr. iv, p. 56 (1806).

Type, *T. sanguinolenta*, Scop.*

Triecphora nyassae.

Tomaspis nyassae, Dist. Trans. Ent. Soc. Lond. 1878, p. 177; Waterh. Aid Ident. Ins. t. xxiv. (1880-2).

Tomaspis mirabilis, Schout. Ann. Soc. Ent. Belg. xlvi. p. 118 (1901).

Hab. E. Africa.

Triecphora picturata, sp. n.

Head (including face), scutellum, pro- and mesosterna, and legs black; posterior femora testaceous; pronotum stramineous, the anterior and anterior-lateral margins black; abdomen above and beneath pale testaceous, the anal segment black; metasternum stramineous or pale testaceous; tegmina black, nearly basal half (excluding broad costal margin) and a large discal spot on apical area stramineous, in some specimens the latter spot ochraceous; wings pale fuliginous; vertex broadly foveately apically impressed; pronotum very finely wrinkled, posterior tibiae with two strong spines, one near base, the other near middle; face centrally longitudinally carinate.

Long., excl. tegm., 6½-7 mm.; exp. tegm. 19 mm.

Hab. N.W. Rhodesia; Kambove, Katanga (Neave, Brit. Mus.).

Triecphora daltoni, sp. n.

Body and legs black; an elongate spot at each lateral angle of the scutellum, margins of the abdominal segments (very prominent above and much more obscure beneath), and coxal spots sanguineous; tegmina black, a short basal subcostal longitudinal streak and the apical third testaceous; wings very pale fuliginous, subhyaline, piceous at base and fuscous at apical margin; vertex with a basal central longitudinal ridge, on each side of which is a broad central longitudinal foveation; pronotum rugosely punctate; face very

* This species has usually been ascribed to Linnaeus, but Maurice Royer has recently (Bull. Soc. Ent. Fr. 1903, p. 297) shown that Linnaeus included three species under that name and that the species is definitely fixed by Scopoli (Ent. Carn. p. 112, fig. 330, 1763).

prominent and centrally longitudinally ridged, greyishly transversely striate on each lateral area; rostrum about reaching the intermediate coxae; abdomen beneath densely shortly greyishly pilose; posterior tibiae with a single strong spine about one-third before apex.

Long., excl. tegm., 9½ mm.; exp. tegm. 23 mm.

Hab. West Africa (*Dalton*, Brit. Mus.).

Triecphora johannæ, sp. n.

Head, pronotum, scutellum, body beneath, and legs pale castaneous brown, abdomen above brownish ochraceous, apex of scutellum pale ochraceous; tegmina black, crossed by two transverse greyish fasciæ, the broadest near base, the narrower at about one-third before apex; wings pale fuliginous; head foveately impressed on each lateral area at inner side of eyes; pronotum very finely wrinkled and punctate, roundly subfoveately impressed on each side near anterior margin and behind eyes; face angulate and very strongly centrally longitudinally ridged; posterior femora with one strong spine at about one-third before apex.

Long., excl. tegm., 10 mm.; exp. tegm. 24 mm.

Hab. Comoro Islands; Johanna (*Bewsher*, Brit. Mus.).

This is the specimen referred to by Dr. Butler (Ann. & Mag. Nat. Hist. (5) iv. p. 41, 1879) as an apparently new species of *Phymatostetha*, contained in a small collection of Arachnida from the island of Johanna. It has been reset, and is now in perfect condition.

Triecphora karschi, sp. n.

Tomaspis binotata, Karsch (nec Dist.), Stett. ent. Zeit. 1894, p. 114, t. ii. fig. 8.

Karsch probably intended to ascribe this species to my *T. conspicua* rather than to *T. binotata*, with which it has little in common. From *T. conspicua* it differs by having the abdomen above black, not sanguineous or dull reddish; the legs black; tegmina with a small red spot nearer to apex than the much larger spot in *conspicua*. Structurally it is distinct by the formation of the face, which is not "robustly and convexly tumid" as in *conspicua*, but smaller, compressed, and with a very distinct central longitudinal ridge extending about halfway from base.

Hab. West Africa; Barombi (fide Karsch); Cameroons (*Escalera*, Brit. Mus.); Calabar (*Rutherford*, Coll. Dist.).

Genus LOCRISS.

Locris, Stål, Hem. Afr. iv. p. 57 (1866).

Type, *L. rubra*, Fabr.

Locris auripennis, sp. n.

Head above, pronotum, and scutellum orange-yellow; more than basal half of head, pronotum with a broad sub-anterior fascia not reaching lateral margins, and a broad basal fascia not reaching the posterior lateral angles, black; scutellum with four small basal black spots, one at each basal angle and two (strongly foveate) between them; abdomen above black, the segmental margins carmine-red; body beneath and legs black; basal margin and central fascia to face (the latter reaching to about middle), lateral areas of prosternum (containing a black spot), apices of femora, tibiæ, and tarsi orange-yellow, bases and apices of tibiæ and apices of tarsi black; metasternum more or less sanguineous; tegmina golden yellow, with two small black marginal spots, one at apex of clavus, the other above it at costal margin; wings shining fuliginous, the basal area and apex blackish, extreme base sanguineous; pronotum rugosely punctate, more so on posterior half, with a central carinate line not reaching anterior margin; face compressed, centrally longitudinally carinate; posterior tibiæ with a strong spine at about one-third from apex; tegmina nearly three times as long as broad.

Long., excl. tegm., 9 mm.; exp. tegm. 25-25½ mm.

Hab. N.W. Rhodesia; W. of Kambove (Neave, Brit. Mus.).

Allied to *L. erythromela*, Walk., but a larger insect; colour of tegmina different, base of clavus concolorous, not black, small foveate spots at base of scutellum, &c. The British Museum possesses a long series of this species.

Locris katangensis, sp. n.

Head black, a narrow ochraceous marginal spot in front of each eye, face and clypeus black, the narrow ochraceous spots above visible beneath on each side of base; pronotum black, anterior and lateral margins connected with a central transverse fascia, ochraceous; scutellum ochraceous, with four small blackish obscure spots at base, the two central spots foveate; abdomen above carmine-red, the lateral margins black; body beneath and legs black, the tibiæ

(excluding bases and apices) sanguineous; metasternum more or less sanguineous, lateral margins of prosternum ochraceous; tegmina brownish ochraceous, bases of costal and outer claval margins pale ochraceous; wings fuliginous, the basal and apical areas darker, extreme base sanguineous; pronotum coarsely punctate, posteriorly moderately rugose; face moderately compressed, outwardly convex, with a central longitudinal carinate line; posterior tibiae with a prominent spine beyond middle.

Long., excl. tegm., 8 mm.; exp. tegm. 23 mm.

Hab. N.W. Rhodesia; Kambove, Katanga (Neave, Brit. Mus.).

Apparently somewhat allied to *L. vestigans*, Jacobi.

Locris spectabilis, sp. n.

Head, pronotum, and scutellum black; head with a spot on each lateral margin in front of eyes and the anterior, lateral, and posterior margins of pronotum ochraceous; abdomen above brownish ochraceous, the lateral margins macularly black; body beneath black; the ochraceous spots to margins of head above visible on each side of face; lateral margins of prosternum ochraceous; legs pale testaceous, anterior femora streaked above, intermediate and posterior femora (excluding apices), apices of tibiae, and the tarsi black; margins of the abdominal segments beneath testaceous; tegmina very pale ochraceous, their apices roseate; wings hyaline, a prominent black basal spot and the apical and posterior margins fuscous; pronotum punctate, slightly rugose, with a central longitudinal carinate line neither reaching the anterior nor posterior margins; face sub-globose, not prominently compressed, centrally longitudinally carinate, outwardly convex; tegmina densely finely punctate; posterior tibiae with a prominent spine at about one-third from apex.

Long., excl. tegm., 9 mm.; exp. tegm. 24 mm.

Hab. N.W. Rhodesia; Lualaba R. (Neave, Brit. Mus.).

Locris antinori, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; a marginal spot on each side of head in front of eyes, anterior and anterior-lateral margins of pronotum, a small spot near apex of scutellum, a marginal spot between face and eyes, and segmental margins to abdomen beneath, ochraceous; abdomen above sanguineous, the segmental margins paler, and with a marginal series of large black segmental spots on

each side ; tegmina black ; costal area from base to near apex, where it is obliquely deflected inwardly, apical margin, posterior claval margin, and some obscure macular discal suffusions pale testaceous ; wings pale fuliginous, subhyaline, basal area and apical margin piceous, extreme base sanguineous ; pronotum coarsely punctate and posteriorly rugose, a fine central carinate longitudinal line not reaching posterior margin ; face with a central longitudinal carinate line ; posterior tibiae with a moderately strong spine at about one-third from apex.

Long., excl. tegm., 10 mm. ; exp. tegm. 24 mm.

Hab. Abyssinia ; Shoa (*Antinori*, Atkins. Coll., Brit. Mus.).

Locris areata.

Monecphora areata, Walk. List Hom. iii. p. 675 (1851).

Var.—Agreeing with typical *L. areata*, but tegmina with nearly basal half of claval area continued upward in an oblique fascia to near costal margin, pale ochraceous, this ochraceous marking more or less margined with black spots which vary in number and intensity in different specimens.

Note.—In typical specimens of *L. areata* there are generally obsolete indications of the ochraceous basal coloration.

The variety above described is represented in the British Museum by specimens from Zanzibar, Tanganyika, and E. Witu in Brit. E. Africa.

Locris incarnata.

Monecphora incarnata, Walk. List Hom. iii. p. 677 (1851).

Locris distanti, Schout. Ann. Soc. Ent. Belg. xlv. p. 120 (1901).

This species is found in the Transvaal, a habitat which may, perhaps, represent the "Interior of South Africa," as given by Walker.

Var.—Many of the veins and a spot near costal margin in the apical area of the tegmina ochraceous.

Hab. Angola (Brit. Mus.).

Var. angolensis.

All the sanguineous coloration replaced by ochraceous.

Hab. Angola (Brit. Mus.).

Locris apicalis, sp. n.

Head black, the apical margin from in front of eyes sanguineous; pronotum sanguineous, a broad transverse anterior fascia not reaching the lateral margins and a transverse subbasal fascia medially interrupted, black; scutellum black; abdomen above sanguineous, with a marginal segmental series of black spots on each side; body beneath and legs black; a central longitudinal fascia to face, the clypeus, lateral margins of prosternum, anterior femora (excluding base), apices of intermediate and posterior femora, the tibiae and narrow segmental ventral margins, sanguineous, abdominal apical segment sanguineous, with a black spot on each side; tegmina sanguineous, the apical area black between the veins, some of which are flavescens; wings very pale fuliginous, subhyaline, darker at basal area and on inner membranal margin, extreme base sanguineous; pronotum punctate, not rugose; face compressed, moderately centrally longitudinally carinate; posterior tibiae with a prominent spine at about one-third from apex.

Long., excl. tegm., 7 mm.; exp. tegm. 22 mm.

Hab. N.W. Rhodesia; W. of Kambove (*Neave*, Brit. Mus.).

Allied to *L. incarnata*, Walk.

Locris rhodesiana, sp. n.

Head, pronotum, and scutellum black; a lateral spot on head in front of eyes and lateral and posterior margins of pronotum sanguineous; abdomen above sanguineous, shaded with black, especially near base and apex; body beneath and legs blackish, apices of the femora, and the whole of the tibiae sanguineous; tegmina with the basal third sanguineous, remaining area creamy-white, darkening to pale ochraceous between the veins on apical area, a large black oblique spot commencing on costal margin of apical area, and the apical marginal area irregularly spotted with piceous; wings hyaline, about basal third and the apical margin piceous, extreme base sanguineous; face globose; pronotum coarsely punctate but not rugose, tegmina with the veins very prominent, and the surface between them foveately depressed except on basal third.

Long., excl. tegm., 6 mm.; exp. tegm. 18 mm.

Hab. N.E. Rhodesia; W. of Medona (*D. Macdonald*, Brit. Mus.).

Allied to *L. concinna*, Dist., from Damaraland.

Locris hindei, sp. n.

Head, pronotum, scutellum, and body beneath black; a marginal spot in front of each eye and narrow lateral and posterior margins to pronotum sanguineous; abdomen above sanguineous, the base and some transverse fasciae black; femora black, their apices and the whole of the tibiae sanguineous; tarsi black, with their bases sanguineous; the ventral segmental margins and the base of anal segment sanguineous; tegmina with about basal third sanguineous, followed by a central transverse stramineous fascia, remaining area to apex fuscous, where the veins are sanguineous or stramineous; wings very pale fuliginous, hyaline, the base and apical margin fuscous; pronotum punctate, not rugose; tegmina densely and finely punctate, the veins on the apical area prominently thickened; face compressed, rounded in front, not angularly prominent nor centrally carinate; posterior tibiae with a moderately strong spine at about one-third from apex.

Long., excl. tegm., 6 mm.; exp. tegm. 17 mm.

Hab. Brit. E. Africa; Machakos (*S. L. Hinde*, Brit. Mus.).

Locris neavei, sp. n.

Head, pronotum, scutellum, and body beneath black; head above with three marginal spots (one at apex and one in front of each eye), a central longitudinal fascia to face, clypeus, lateral and anterior margins to pronotum and a central longitudinal fascia extending from base to middle, sanguineous; abdomen above purplish red, the segmental margins paler; legs sanguineous, bases of femora, apices of tibiae, and the tarsi black; tegmina with basal third sanguineous, containing a fuscous streak on inner claval margin; this is followed by a central transverse stramineous fascia much broadened on costal margin, remaining area to apex black; wings pale fuliginous, extreme base sanguineous; pronotum punctate, not rugose; tegmina densely finely punctate; face compressed, rounded, not angularly prominent nor centrally carinate; posterior tibiae with a strong spine at about one-third from apex.

Long., excl. tegm., 8 mm.; exp. tegm. 19 mm.

Hab. N.W. Rhodesia; W. of Kambove (*Neave*, Brit. Mus.).

Locris kambovensis, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; head with a testaceous marginal spot in front of each eye;

bases and apices of coxae, extreme bases and apices of femora, abdomen above and base of abdomen beneath, dull sanguineous; connexivum black; tegmina stramineous, with castaneous suffusions which may be described as a short linear basal longitudinal line, upper claval margin (excluding base), a broad central longitudinal streak on apical half of clavus, a broad transverse fascia commencing near middle of costal margin and at middle of tegmen deflected and continued in two longitudinal fasciae to apical area, which is also castaneous, with its apical margin black; wings very pale fuliginous and hyaline, base and apex fuscous, extreme base dull sanguineous; pronotum punctate, not rugose; tegmina densely finely punctate, the veins in apical area raised and prominent; face much compressed and angularly prominent, centrally strongly carinate; posterior tibiae with a strong spine at about one-third from apex.

Long., excl. tegm., 7-7½ mm.; exp. tegm. 20 mm.

Hab. N.W. Rhodesia; W. of Kambove and Lualaba R. (Neave, Brit. Mus.).

Locris chersonesia, sp. n.

Head above, pronotum, scutellum, face, and lateral margins of prosternum golden yellow; abdomen above sanguineous; body beneath and legs sanguineous, face and prosternum golden yellow; eyes, mesosternum, base of abdomen beneath, coxal spots, and anterior and intermediate tarsi black; tegmina golden yellow, a large roseate spot near middle of costal area deflected to near middle of tegmen and then continued in two longitudinal fasciae to apical area, which is also roseate; wings very pale fuliginous, subhyaline, basal area blackish; pronotum punctate, not rugose; face compressed, strongly centrally longitudinally carinate, laterally finely transversely striate; posterior tibiae armed with a long spine at about two-thirds from base.

Long., excl. tegm., 7 mm.; exp. tegm. 21 mm.

Hab. N.W. Rhodesia; W. of Kambove (Neave, Brit. Mus.).

Locris aenea, sp. n.

Body pale bronzy ochraceous; margins of the metanotum, meso- and metasterna, abdomen beneath and legs black; anterior femora and anal abdominal segment bronzy ochraceous; tegmina brassy yellow, the apical and inner margins narrowly fuscous; wings very pale fuliginous, subhyaline, basal area infuscate; pronotum punctate, but not rugose, and

with a distinct central longitudinal carinate line; lateral areas of the abdomen above macularly black; face moderately compressed, medially centrally longitudinally carinate, the lateral areas finely transversely striate; posterior tibiae with a strong spine at about one-third from apex.

Var.—With the legs bronzy ochraceous.

Long., excl. tegm., 6 mm.; exp. tegm. 19 mm.

Hab. Tanganyika (Brit. Mus.). Transvaal; Waterval-Onder (Ross, Coll. Dist.).

Locris submarginata, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; coxal spots and apices of femora sanguineous; abdomen above sanguineous, the lateral margins and apex black; tegmina testaceous red, a curved fascia before apical area, some large spots in the cells of apical area, and the apical margin, which is strongly subdentately produced inwardly, black; wings very pale fuliginous, subhyaline, basal area piceous, extreme base sanguineous; pronotum punctate, not rugose; face compressed, strongly centrally longitudinally carinate; posterior tibiae with a strong spine at about one-third from apex; tegmina densely finely punctate, the veins on apical area moderately prominent.

Long., excl. tegm., 8 mm.; exp. tegm. 22 mm.

Hab. N.W. Rhodesia; Lualaba R. (Neave, Brit. Mus.).

XXXVI.—*Descriptions and Records of Bees.*—XX.

By T. D. A. COCKERELL, University of Colorado.

Anthophora melfordi, sp. n.

Represented by the head, thorax, and first abdominal segment, with the mouth-parts extended and the wings well preserved. Black; wings dusky hyaline, with black or very dark brown nervures. Head almost 4 mm. long, and the same in width; thorax about 5 mm. long and broad; anterior wing just over 8 mm. long; extended mouth-parts about $4\frac{1}{2}$ mm. Legs robust, hairy; claws deeply cleft, the outer tooth much longer than the inner; anterior basitarsus with a lateral fringe of long hair, of which the first hairs are longest and the others successively shorter; middle tibial spur stout, very finely and minutely pectinate, like the hind spur of *Centris* (from the

position of the leg the one spur visible appears to be on the middle tibia of the left side, but from the pectination of the spur I suspect that it is really the right posterior leg twisted under the body); hair of legs dark fuscous; tongue with copious long hair, and extending more than 1360 μ beyond maxillæ; maxillæ extending about 3230 μ beyond head; width of mouth-parts at base (where they leave the head) about 1020 μ .

Venation normal both in anterior and posterior wings (including the very oblique t.-m. of the latter), except that the first r. n. reaches the second s.m. near the beginning of its last third instead of at the middle. The following wing-measurements are in μ :—

Length of marginal cell	1750
" first discoidal cell	2600
First t.-c. to insertion of first r. n.	510
Insertion of first r. n. to second t.-c.	255
Third s.m. on marginal.....	408
Lower side of third s.m.	510
Length of third s.m. in middle	645
Marginal cell beyond third s.m. (measured along its lower margin)	765

The b. n. meets t.-m., the upper part of which is bowed outwardly.

Hab. Florissant; fossil in the Miocene shales, Station 13 B (*Melford Smith*, 1908).

This is the first genuine fossil *Anthophora*; the *A. effossa*, Heyden, from Rott, exhibited no wings, and cannot be referred with certainty to any particular genus.

Calyptapis florissantensis, Ckll., 1906.

This genus and species were based on an imperfect specimen obtained by Scudder, and were referred to the Eucerine Anthophoridae. A very good example collected in the Miocene shales at Florissant in 1908 (Station 13 B, *W. P. Cockerell*) enables me to determine that it is in fact a member of the Bombidae very close to *Bombus* in most respects, but differing in the form of the third submarginal cell and in the somewhat less specialized second submarginal.

It is stout-bodied, with hairy legs, quite as in *Bombus*; head and thorax black; abdomen rather pale reddish, the junctions of the segments marked by moderately broad light bands; the abdomen is not noticeably hairy. The hind basitarsus is flattened and quadrate, broadly emarginate

apically, and with hairy margins; its dimensions in μ are: (1) length 1530, (2) breadth at base 1105, (3) breadth at apex 900. Claws bifid, with the inner tooth much the smaller and shorter, precisely as in *Bombus*.

Wings clear, with pale nervures; length of anterior wing about 8½ mm.

Length of body about 15 mm.

The following measurements of the anterior wing are in μ :—

Length of marginal cell	2380
Depth	595
Length (obliquely) of first submarginal	1020
" of second submarginal	765
" of third	1020
Second submarginal on "marginal	340
Third	510
Second submarginal on first discoidal	391
" third	459
Third	867
Height of third submarginal in middle	425
Insertion of second r. n. to appendicular nervure at end of third s.m.	170
Length of first discoidal cell (obliquely)	2312
" of transverso-medial nervure	255
Width of second discoidal cell at apex	765
Length of basal nervure	1836

The transverso-medial is vertical except at its upper end, where it bends basad and actually meets the basal. This band is easily overlooked, giving the impression that the nervure ends a short distance apicad of the basal.

In the above table of measurements the first and third submarginals appear of equal length; but if measured in the same manner, i. e. from the middle of the basal to the middle of the apical side, the third is much the longer.

The new specimen is on a slab with various leaves; a leaf of *Fagus longifolia* (Lx.) is less than an inch from the bee, and a leaflet of *Weinmannia phenacophylla*, Okll., is equally close.

This species is of great interest to me, because I have just been studying the ancestors of the Bombidae in Baltic amber of Oligocene age. The amber materials, kindly loaned from the Museum at Königsberg through Dr. A. Tornquist, throw a flood of light on the subject, including as they do numerous genera and species in a wonderful state of preservation.

The following is a list of the fossil Bombiform bees; the *Ann. & Mag. N. Hist.* Ser. 8. Vol. ii.

descriptions of those from amber will be published at Königsberg :—

- (A) Small compact bees about 8 to 9 mm. long, often with metallic colours. All from Baltic amber.
- (a) Second t.-c. absent; b. n. going basad of t.-m.; stigma well developed.
- 1. *Sophrohombus fatalis*. Representing a side branch of the primitive Bombidae, not leading to anything modern.
 - (b) Three submarginal cells, as usual; b. n. meeting t.-m.
 - (i.) Stigma distinct, but short.
- 2. *Chalcobombus martialis*. Third s.m. very broad (480μ) above. Mesothorax, scutellum, and vertex dull black; prothorax, tubercles, and legs coppery red.
- 3. *Chalcobombus hirsutus*. Head and thorax with long pale hair; wings reddish fuliginous.
- 4. *Chalcobombus humilis*. Abdomen with a sericeous lustre and a decided green tint, the hind margins of the segments broadly reddish.
- (ii.) Stigma obsolete; third submarginal cell produced apically.
- 5. *Protobombus indecisus*. Wings rather light fuliginous, with a very dark fuliginous cloud at end of marginal cell.
- (B) About the size and build of the honey-bee (*Apis*), but with the eyes naked; stigma very small; b. n. meeting t.-m.; hind tibiae with a single short sharp spur. Species from amber.
- 6. *Electrapis meliponoides*. Showing characters transitional to *Apis*, but not a direct ancestor of that genus.
- (C) *Bombus*-like, stout-bodied bees.
 - (a) Length about 11 or 12 mm.; head and thorax very hairy; b. n. going basad (170μ) of t.-m.; malar space obsolete. From amber.
- 7. *Electrapis* (?) *tornquisti*. This is the most *Bombus*-like of the amber-bees.
 - (b) Length about 15 mm.; b. n. meeting t.-m., but bending at upper end to do so. Florissant (Miocene).
- 8. *Calyptapis florissantensis*.

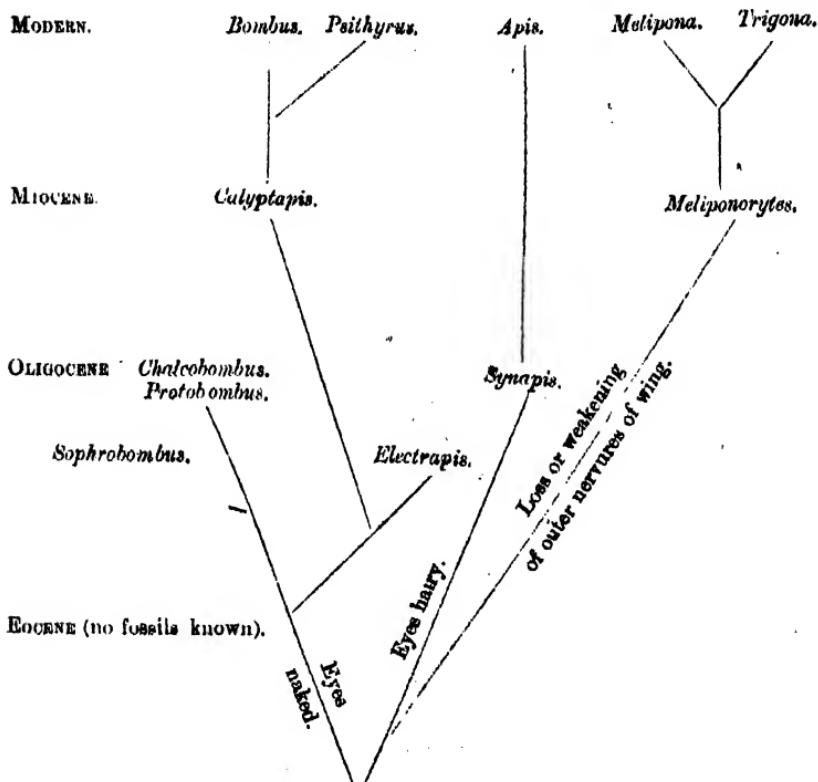
The Bombidae thus appear to have originated in Europe, but to have reached America as early as the Miocene. *Apis*, though widespread in the Old World, apparently never reached America until brought over by man.

The only known fossil *Apis*, in any true sense, is *Apis henshawi*, Ckll., from Rott, Prussia (Upper Oligocene). In this species, however, the b. n. almost meets the t.-m., so it has been regarded as forming a distinct subgenus, *Synapis*. The character is one which allies it with the ancient Bombidae. *Apis adamitica*, Heer, from Oeningen (Upper Miocene), is

perhaps related to *Synapis* (it certainly is not a typical *Apis*), but it is so imperfectly preserved and described that its affinities are doubtful.

The Meliponine bees, now so abundant in the tropics of both hemispheres, are only known in the fossil state by a single species, *Meliponorytes succini*, Tosi, from Sicilian amber (Middle Miocene). In this insect the first submarginal cell is complete and well-defined, but the others are absent.

The general scheme of relationships will be about thus:—



Although *Bombus* and *Psithyrus* are thus derived from *Calyptapis* in the diagram, this must not be taken too literally, as meaning that they are of American origin. *Calyptapis* very probably occurred in both hemispheres, as *Bombus* does to-day, or was represented in Europe and Asia by allied genera, from which *Bombus* might equally well be derived *.

* It would even be possible to use *Calyptapis* as an argument in favour of the Old-World origin of *Bombus*. It is recognized that nearly all

Various species ascribed to *Bombus* have been described from the Oligocene and Miocene of Europe, but they require reinvestigation. Buttel-Reepen (Mitt. Zool. Mus. Berlin, 1906, p. 163) has given a scheme of evolution of the Bombidae &c. differing somewhat from the above. He was not, of course, acquainted with the numerous new amber genera, and he took too seriously some of the generic references of the older authors.

Andrena hypolitha, sp. n.

♀.—Length about 10 mm.

Head broader than long (width of head $2\frac{3}{4}$ mm., breadth between eyes in middle of face about 1700μ); head and thorax black; legs ferruginous, tibiae and tarsi hairy, claws bifid. Length of anterior wing not over 6 mm.; nervures and stigma pale ferruginous. Abdomen oval, about $5\frac{1}{2}$ mm. long and slightly over $3\frac{1}{2}$ broad (no doubt broadened somewhat by flattening); colour of abdomen light ferruginous, with four broad dark ferruginous bands, the first very broadly interrupted, the margins of the bands are suffused and ill-defined.

Stigma large; lower section of basal nervure straight except at its lower end, which is abruptly bent; second s.m. receiving first r. n. beyond the middle; first discoidal cell very long and narrow, possibly a little narrower than normal by distortion; third t.-c. with a strong double curve; end of marginal cell obliterated, but its probable total length less than 1700μ . Transverso-medial of hind wings almost vertical, the lower end a little more basad.

The following measurements of the anterior wing are in μ :

modern insect-genera are older than the Miocene; hence if *Bombus* already existed it would probably be in the Old World, and *Calyptapis* would represent an earlier type segregated in America, to be exterminated later by the invasion of *Bombus*.

Second s.m. on first discoidal	289
third	102
Length of " third submarginal cell	578
" first discoidal cell	1700
Upper section of basal nervure	272
Lower " " " (not allowing for curve)	748

In the hind wing the t.-m. is 170μ long and the distance from the t.-m. to the cubital is 714.

Differs from *A. sepulta* and *A. clavula* by having the second s.m. much broader above and various details of the venation. From *A. clavula* it also differs in the form of the abdomen.

Hab. Miocene shales of Florissant, Station 13 B (1908).

Stelis seneciophila, sp. n.

♀.—Length about $7\frac{1}{2}$ mm.

Brilliant dark shining blue, with black pubescence; punctures on head and thorax strong and dense, but well separated on front; punctures on abdomen somewhat smaller and more separated, but extremely dense on the apical two segments; tegulae and legs dark blue. Wings nearly clear, but the apex greyish and a grey shade in marginal cell; second r. n. going beyond end of second t.-c.

Closely related to *S. montana*, Cresson, but smaller and more slender, with no green tints, and with clearer, not brownish, wings. The first r. n. joins the second s.m. as far from its base as half the length of the first t.-c., or nearly that; in *montana* it is nearer to the base of the cell, or even sometimes meets the t.-c. The last two joints of the labial palpi are conspicuously more slender than in *montana*.

Hab. Florissant, Colorado, at flowers of *Senecio cymbalariaeoides*, June 29, 1908 (S. A. Rohwer).

S. montana also occurs at Florissant, and is variable in size and colour (the largest ♀ is $10\frac{1}{2}$ mm. long), but always readily distinguishable from *S. seneciophila*.

Dioxyx rohweri, sp. n.

♂.—Length about $6\frac{1}{2}$ mm.

Black, densely punctured, with white pubescence; abdomen with the usual white hair-bands; hind margin of sixth segment ferruginous; tibial spurs bright ferruginous; hair on inner side of tarsi yellowish; tegulae with a large ferruginous spot. Wings dusky hyaline, upper half of marginal cell faintly clouded. Eyes pale greenish.

The smallest American species of the genus; nearest to *O. martii*, Ckll., from which it differs by the much smaller size, very much finer punctures, more delicate thoracic spine, and the much smaller (almost rudimentary) subapical lateral spines of abdomen. The flagellum is only faintly reddish beneath.

Hab. Troublesome, Colorado, alt. 7345 ft., June 9, 1908 (*S. A. Rohwer*).

Osmia bruneri, Ckll., ♂.

At Troublesome, Colorado, June 8 and 9, 1908, Mr. S. A. Rohwer took both sexes of this species.

The male is about 8 mm. long, short and compact like the female, with the most brilliant colours. Clypeus a splendid purple; sides of face largely green; vertex blue and purple; cheeks green; thorax (including tegulae) yellowish green, bluer at sides; abdomen brilliant green, bluer at sides and apex; legs blue-green, but tibiae black or nearly so on one side; hair of thorax above and occiput white without any admixture of black; hair of vertex and clypeus black, but that of sides of face white; apical segments of abdomen with black hair; sixth segment with a distinct notch, seventh bidentate.

In my table in Ann. & Mag. Nat. Hist., Aug. 1907, p. 123, it runs to *O. bennettæ*, from which it is easily distinguished by the black hair of the clypeus, the shape of the abdomen, &c.

Osmia gaudiosa, Ckll.

♂.—Florissant, Colorado, at flowers of *Mertensia lanceolata*, June 19, 1908 (*S. A. Rohwer*).

The specimen has the abdomen more shiny than that of the type, but I believe there is only one species.

Diandrena nothocalaidis, Ckll.

Troublesome, Colorado, at flowers of *Nothocalais cuspidata*, June 9, many females (*S. A. Rohwer*).

Previously known only from Boulder.

Andrena pyrrhocita, Ckll., var. *mosina* nov.

♀.—Hair of face and front almost entirely black; clypeus finely punctured, with a very distinct smooth median line; much black hair at sides of metathorax; hair of thorax above

pale, as in type, of abdomen (except at base and apex) sub-appressed and very bright orange-fuscous; hair of abdomen beneath and at extreme sides practically all black.

Ilab. Troublesome, Colorado, at flowers of *Salix*, June 8, 1908 (*S. A. Rohwer*).

The characters of this variety make it resemble the European *A. fulva*. The size and form and small clypeal punctures readily separate it from *A. hitei*. The varietal name is from a Malay word for red. Mr. Rohwer also took *Andrena erythroyastra* (Ashm.) at Troublesome on flowers of *Salix*.

Sphecodes sulcatus, Ckll.

A female from Troublesome, Colorado, June 9, 1908 (*S. A. Rohwer*), is smaller than the type and lacks the median groove on first abdominal segment, but is evidently conspecific. The species is noticeable for its shining thorax.

Titusella pronitens, Ckll.

The females were found commonly at Florissant this year, visiting the flowers of *Senecio cymbularioides* during the latter part of June.

A second species of this genus is *Titusella cubiceps* (*Heriades cubiceps*, Cresson) from Nevada; distinguished by its white ventral scopa and clear wings.

Bombomelecta pacifica (Cresson).

Florissant, Colorado, June 12, at flowers of *Ribes*, 1 ♀ (*S. A. Rohwer*).

The *B. fulvula*, common at Boulder, seems to be only a race of *pacifica*, as Cresson held.

Melissodes martini hitei, subsp. n.

♀.—Differing from *M. martini*, Ckll. (from New Mexico), by the total absence of black hair on thorax above, the presence of black hairs on vertex (occasionally *martini* has a few), the soot-coloured hair on middle basitarsus, and the hind basitarsus with the hair on its inner side ferruginous at base, but otherwise dark fuscous. The abdominal hair-bands, as in *martini*, are pure white.

In my tables in *Trans. Am. Ent. Soc.* 1906, if placed with the species having the hair on hind basitarsus ferruginous, it

runs to *M. thelypodii*, Ckll., to which it is closely allied, differing conspicuously, however, in the colour of the pubescence. If placed with the species having the hair on hind basitarsus fuscous, it runs to *M. blakei*, Okll., which differs greatly in the colour of the abdominal pubescence, and is not especially related. The eyes of *hitei* are light green.

Hab. Pueblo, Colorado, Aug. 17, 1907 (*G. M. Hite*).

The *Melissodes* of the *martini-thelypodii* series do not visit Compositæ (so far as our records show); those of the *blakei-mizeæ* series are visitors of Compositæ.

Tetralonia chrysobotryæ, sp. n.

♀.—Length about 15 mm.; anterior wing 9 mm.

Abdomen with very conspicuous entire pale bands on segments 3 and 4; on 1 and 2 the hair is mouse-colour, but the band on 2 is whitish posteriorly at the sides; on the fifth segment the broad apical band has the middle third dark reddish fuscous and the lateral thirds brownish white; hind basitarsi with the hair on inner side bright ferruginous and on the outer golden; small joints of tarsi ferruginous.

In my table in Trans. Amer. Ent. Soc. 1906, this runs to *T. speciosa* or *cordleyi*, the hind spur not being at all hooked. Compared with *speciosa* it is considerably smaller, with much darker tegulæ, and the bands on abdominal segments 2 and 3 practically straight, not undulating laterally as in *speciosa*. Compared with *T. cordleyi* it is narrower, and the hair on the fifth abdominal segment is quite differently coloured. Compared with *T. frater aragalli* it is easily known by the narrower and much whiter bands on segments 3 and 4. These bands, however, are yellowish white, not greyish as in *T. annæ*.

♂.—Hair of thorax above yellowish white or very pale yellow; clypeus, labrum, and small supraclypeal mark pale lemon-yellow; yellow of clypeus squarely notched at sides; mandibles with a very minute light basal spot; second abdominal segment covered with pale hair, except the apical margin, where it is black; tarsi ferruginous, normal, hind basitarsus a little longer than the other joints together.

In my tables runs to *T. frater* (Cresson), having the mesothorax dull and the hind spur normal. Compared with *frater* (a Cressonian cotype) it differs by the longer (much longer than wide) third antennal joint, the lighter yellow of the clypeus, the broader face, and the better-defined (though narrow) bands on segments 3 to 5. The fourth and fifth

segments, except for the bands, are shining black, with short black hair. The last ventral segment has a median sulcus and a little groove or channel on each side, the latter being curved and ending abruptly posteriorly. The yellow of the clypeus approaches the orbital margin much more closely than in *T. atriventris*, but not so closely as in *T. edwardsii vagabunda*. The second s.m. is broad, and receives the first r. n. no great distance beyond the middle. The third t.-c. is bent almost to a right angle.

Hab. Boulder, Colorado, May 2, 1908 (Glenn M. Hite).

Both sexes were taken at flowers of *Ribes* or *Chrysobotrya odorata* (Wendl.) ; the *Ribes longiflorum* of Rydberg's 'Flora of Colorado.'

NOMIA.

A critical examination of various specimens of *Nomia*, supposed to be *N. foxii*, D. T. (*punctata*, Fox), shows that several species have been confused. Fox, in his original description, evidently confuses two or more species, and I have found it difficult to determine which ought to be called the true *foxii*. He cites (Entom. News, 1893, p. 135) specimens from Denver, Colorado (Beales), Vega S. José, New Mexico (Townsend), and Big Stone City, S. Dakota (Aldrich). He does not state which is the type locality, but I consider myself at liberty to select the New Mexico species as true *foxii*, a course which may be justified by the fact that it has been frequently referred to in my writings as such, whereas the other forms have not, I think, been alluded to since Fox's paper appeared. Another reason is that Fox classes as a variety the very strongly punctured form, which must, I suppose, be the northern species here separated ; on the other hand, however, he says the tarsi of the female are typically testaceous, which does not accord with what I here call *foxii*. The last character is very likely to be variable and is not nearly so important as the difference in sculpture. The species of the *foxii* group may be separated thus :—

Males.

Abdominal (tegumentary) bands somewhat broader, suffused with emerald-green ; second abdominal segment with a strong basal transverse groove ; punctures of fourth segment minute and close. (El Rito, N. M., Aug. 5, Townsend ; Santa Fe, N. M., July, Ckll. ; common in New Mexico) *N. foxii*, D. T.

Abdominal bands somewhat narrower, suffused with turquoise-blue; second segment flat, with no transverse depression; fourth (except at base) with large punctures; abdomen generally with very large and distinct punctures. (Boulder, Colorado, one, July 6, 1908, picked up on the pavement, struggling with a worker *Pogonomyrmex occidentalis*, Cress., *T. D. A. Cockerell*; one, July 14, *Paul M. Dean*) *N. universitatis*, sp. n.

Females.

Larger; lateral hind margins of first abdominal segment green; mesothorax very sparsely punctured, except at sides. (Washington State.) *N. melanderi*, Ckll.

Smaller; lateral hind margins of first abdominal segment not green or blue 1.

1. Wings greyish; truncation of metathorax less strongly punctured; first abdominal segment with well-separated but numerous punctures; mesothorax closely punctured. (Las Cruces, N. M., Sept. 5, *Townsend*; Rincon, N. M., Sept. 14, *Ckll.*) *N. foxii*, D. T.
- Wings brownish; truncation of metathorax more closely punctured; first abdominal segment shining, with very sparse small punctures; mesothorax with larger punctures, irregular in size and irregularly spaced; punctures of third abdominal segment minute, much smaller than in *foxii*. (Mesilla Valley, N. M., toward Organ Mts., end of September, *Ckll.*, C 4.) *N. mesillensis*, sp. n.

The new species has green bands, as in *N. foxii*.

University of Colorado,
Boulder, Colorado, U.S.A.,
July 15, 1908.

XXXVII.—Descriptions of new Species of New-Zealand Coleoptera. By Major T. BROUN, F.E.S.

G E O D E P H A G A.

Group CNEMACANTHIDÆ.

Mecodema acuductum.
— *cognatum.*
— *lewisi.*
— *seriatum.*
— *attenuatum.*

Diglymma tarsalis.

Snofru æmulator.

Oopterus nigritalus.

— *frontalis.*

— *sculpturatus.*

Group ANISODACTYLIDÆ.

Allocinopus ocularius.

Group ANCHOMENIDÆ.

Dierochile thoracica.
Anchomenus macrocælis.
 —— *xanthomelus.*
 —— *intermedius.*
 —— *integratus.*
 —— *sophronitis.*
Ctenognathus littorellus.
Tarastethus southlandicus.
 —— *carbonarius.*

Group FERONIDÆ.

Trichosternus celocephalus.
 —— *hammerensis.*
 —— *ordinarius.*
Zeopaculus optandus.

Pterostichus turgidiceps.

— *odontellus.*
 — *antennalis.*
 — *oneronaensis.*
 — *flectipes.*
 — *adoxus.*
 — *oxymelus.*
 — *sinuiventris.*
 — *vexatus.*
 — *perbonus.*
 — *philpoti.*
 — *lepidulus.*
 — *chalmeri.*

Group BEMBIDIIDÆ.

Tachys coriaceus.

Group CNEMACANTHIDÆ.

Mecodema acuductum, sp. n.

Elongate, slightly convex, subopaque; black, the elytra a little infuscate or rufescent, legs and antennæ rufo-piceous.

Head with numerous fine but distinct punctures in line with back part of eyes, but only obsolete linear impressions, the vertex almost smooth, there being only three or four feeble transverse impressions, the usual lateral rugæ and longitudinal impressions in front are well marked; labrum broadly rounded and punctured at apex, and with a fine central groove. *Eyes* rather small and not very prominent. *Thorax* one-seventh broader than long, feebly incurved in front, base subtruncate, but little wider near the middle than it is elsewhere, a good deal narrowed towards the almost rectangular but obtuse posterior angles; lateral margins crenulate, the channels not expanded in front; the median sulcus hardly attains either base or apex, being merged with the abbreviated but not deep striæ there; there are a few feeble transverse striæ, and near the base and anterior angles some indistinct punctures; the basal impressions are deep and foveiform, and placed closer to the sides than to the base. *Elytra* elongate, oblong-oval, nearly flat; there are four very finely punctured striæ at each side of the suture, the fifth and sixth are deeper at the base and more distinctly punctured; the seventh interstices are somewhat elevated behind the shoulders, between these and the smooth space near each side there are two series of moderately coarse, closely placed punctures, neither of which reaches the base or apex, marginal sculpture normal; there are no interstitial punctures, but their whole surface, particularly behind, is

rendered dull by minute sculpture and transverse aciculate marks.

Underside moderately shining; head with short, dense, undulating sculpture; the prosternum rather finely and distantly punctate, its flanks more closely and distinctly, intercoxal process broadly grooved; the metasternum and basal ventral segment at the sides finely and distinctly punctured, remaining segments with irregular linear impressions and indistinct punctures; the terminal at the apex bears two setigerous punctures at each side of the middle.

Not glossy like *M. scitulum*, elytral striae more shallow, without punctures on the seventh interstices, quite differently sculptured underneath, and with lateral margins of the thorax crenulate. It differs from all the species with crenulate thoracic margins by the elytral sculpture.

♂. Length 12; breadth $3\frac{1}{4}$ lines.

Mount Holdsworth, Tararua Range, in the birch-forest at an elevation of 1500 to 2000 feet.

Described from one example forwarded by Mr. G. V. Hudson.

Mecodema cognatum, sp. n.

Body moderately elongate, glossy black, the antennæ, legs, palpi, and labrum pitchy red.

Head (eyes included) nearly as wide as thorax, almost smooth, having only some longitudinal rugæ in front and near the eyes; there is one setigerous puncture near each of these. *Mandibles* wrinkled. *Antennæ* pubescent from the fifth joint onwards. *Thorax* $3-3\frac{1}{2}$ lines broad by $2\frac{1}{2}$ in length, slightly incurved in front and at the base, its greatest width near the front, gradually curvally narrowed backwards, without any abrupt contraction near the obtuse basal angles; lateral channels rather narrow, of about equal width throughout until approaching the basal foveæ, which are close to the sides; these bear eight or nine setigerous punctures, but are not crenate; disk but little convex, with a well-marked central furrow, an indefinite curvate impression from one anterior angle to the other, and some short feeble longitudinal impressions near the base and apex, but no very evident transversal rugæ anywhere. *Elytra* elongate, oviform, the shoulders and extremity of about equal width; they are distinctly punctate-striate, the four sutural striae rather fine, with flat interstices; those beyond, however, are deeper, with stronger yet only moderate punctures and distinctly convex interstices; the common smooth space along each side is more

or less punctate, apical sculpture somewhat irregular and coarse.

Underside almost smooth, with six punctures at the extremity of the last ventral segment; on the middle of the back part of the head there are two fine longitudinal lines and numerous fine transverse linear impressions.

Its natural position is between *M. constrictum* and the larger *M. laeviceps*. From the former it may be easily distinguished by its greater bulk, less attenuate hind body, darker legs, and by the absence of any incurvature near the intermediate femora. In *M. laeviceps* the elytral striae are deeper at the base, so as to appear ribbed the c.

Length $11\frac{1}{2}$; breadth $3\frac{1}{2}$ lines.

Castle Hill (*J. D. Enys*) ; Broken River (*J. H. Lewis*).

Obs.—Three specimens are before me. The Broken River specimen is minus an antenna and two legs, and differs in having the sides of the thorax in front somewhat pinched in, so that the lateral channels are a little explanate; this, however, does not alter the general contour, as described above.

Mecodema lewisi, sp. n.

Robust, only moderately convex, shining black; palpi and tarsi piceo-rufous; legs, antennæ, and labrum rufo-piceous; the elytra sometimes of a chocolate hue and subopaque.

Head large, with several distinct longitudinal sulci near the eyes and in front, finer and more irregular ones on the vertex, and a few more or less evident punctures behind; the central space between the antennæ is smooth. *Thorax* $4\frac{1}{2}$ lines broad, $3\frac{1}{2}$ long, nearly parallel-sided from the front for two-thirds of its length, from thence strongly curvate, so that the base is barely 3 lines in width, base and apex subtruncate; lateral margins entire, perceptibly more expanded in front than at the middle; disk more or less feebly transversely striate, basal and apical longitudinal striae only moderately impressed, median sulcus distinct, basal fossæ large; there are two shallow foveæ just behind the middle, and the same number, but more irregular in form, near the front; these appear in one specimen (the larger), but not in the other. *Elytra* oblong-oval in the larger specimen, elongate in the other, base and apex of nearly equal width; their sculpture consists of shallow irregularly formed impressions of very unequal size, which cannot be termed punctures except near the suture, where, however, though much smaller, they are not serial, and are often confluent even within this limited area; over nearly half of each elytron

rather larger smooth spaces occur than amongst the coarser impressions beyond; the intervening spaces are more or less transverse and very irregular; when examined in certain ways three lines may be noticed on each elytron—these are not costæ, being simply linear spaces which are more or less interrupted or obliterated.

The legs are, in proportion to the size of the insect, rather slender; the external apical angles of the front and middle tibiae are but little prolonged; the antennæ are only scantily pubescent.

Underside nearly smooth, ventral segments foveate at the sides, prosternal process broadly grooved between the coxae.

M. costellum, from Stephen's Island, is the only species resembling *M. lewisi*. The former may be identified by looking at the base of the elytra, where the costæ are obvious; its eyes are less convex, there is a transverse and rather closely punctured impression just behind them, and a longitudinal groove on the middle of the back part of the head; the sides of the thorax, instead of being nearly straight near the middle, are gradually narrowed from the front, the widest part, and the hind body is more parallel-sided.

Length 16-17; breadth 4 $\frac{1}{2}$ -5 $\frac{1}{2}$ lines.

Broken River, Canterbury.

If is with pleasure that I name this superb species after Mr. J. H. Lewis, who discovered it, and who informed me that his first specimen measured 19 lines in length.

Mecodema seriatum, sp. n.

Elongate, slightly convex, nitid, nigrescent; legs and antennæ piceous.

Head (the very prominent eyes included) as broad as front of thorax, with coarse longitudinal rugæ in front of the antennal insertion and irregular ones near the sides, the space behind the eyes finely but distinctly punctured and feebly rugose, the middle not smooth. *Thorax* with setigerous punctures, but not crenulate, at the sides, almost as long as broad, scarcely wider near the middle than elsewhere, slightly rounded towards the front, strongly curved and narrowed behind (the sides at the base, however, are quite straight); apex widely incurved, base slightly medially emarginate; median groove deep but not reaching the base or apex, basal fossæ moderate, situated close to the angles, the disk with moderately fine but quite distinct undulating transverse striæ, which on a shallow depression near each anterior angle become coarser and rugose; they are also similarly rugose,

with a few punctures, near the basal fossæ, the base and apex with short, distinct, longitudinal furrows. *Elytra* elongate, oviform, as broad near the apex as at the base; each elytron with eight almost perfectly regular series of punctures, those near the suture of moderate size, the sixth and seventh coarser, the marginal punctures rather shallow, interstices nearly quite smooth.

Front and middle *tibiae* only slightly angulate externally at the extremity. *Antennæ* with the basal four joints glabrous.

Underside black, moderately nitid; middle of prosternum smooth, its flanks distinctly but not coarsely punctate, sides of meso- and metasterna rather more closely; ventral segments more or less finely wrinkled and punctured, the terminal at the extremity bipunctate at each side of the middle.

There is no similar species with regular serial elytral punctuation.

♂. Length 10; breadth 3 lines.

Kinloch, Lake Wakatipu.

One specimen from Mr. G. V. Hudson, who discovered it.

Mecodema attenuatum, sp. n.

Differs from *M. rugicolle* as follows:—

Larger and altogether more brilliant. *Thorax* larger, $3\frac{1}{2}$ lines in length and breadth, its sides distinctly and rather deeply crenulate, the rugæ more deeply impressed. *Elytra* much more narrowed posteriorly, their whole surface very irregularly marked with radiating aciculate impressions, the lateral sculpture coarser and more foveiform. The head not smooth on the middle, being finely rugose there; labrum also rugose; the eyes more prominent.

Flanks of prosternum transversely rugose-punctate; mesosternum medially finely rugose, laterally closely rugose-punctate; basal ventral segment punctured near each side, the others finely wrinkled, the terminal much narrowed towards the extremity.

Length $13\frac{1}{2}$; breadth $3\frac{1}{2}$ lines.

Tapawera, Nelson.

One example from Mr. G. V. Hudson, who also sent me a male of *M. rugicolle*, found at Wakapuaka, Nelson, the type of that species being a female from Taranaki and measuring $11 \times 3\frac{1}{2}$ lines.

Diglymma tarsalis, sp. n.

Elongate, subparallel, moderately convex, nitid; fusco-testaceous, the *tibiae*, *tarai*, and *antennæ* rufescent.

Head (including the prominent eyes) as wide as front of thorax; lateral grooves deep, each separated from the eye by a distinct carina, frontal impressions elongate and rather shallow, feebly sculptured; there is a slight constriction and a series of small punctures behind the eyes. *Thorax* almost as long as broad, widest near the front, lateral margins fine but distinct, its sides a very little rounded till near the minute sinuosity or oblique contraction at the obsolete posterior angles; disk smooth, its longitudinal groove abbreviated, basal fossæ rather elongate and situated close to the angles, between these there are a few minute punctures. *Elytra* elongate, very little curvate at the sides, shoulders quite obtuse and a good deal narrowed; their striæ rather shallow and finely punctured.

Antennæ reaching backwards to middle of thorax, basal three joints and part of fourth glabrous, remaining joints with conspicuous yellow pubescence.

Legs moderately stout, tibiae not prolonged or incrassate at the extremity, the anterior with six coarse spiniform setæ on the outer face near the apex.

Male.—Anterior *tarsi* with fine setæ at the sides, basal four joints somewhat expanded; the basal two largest, second quite transverse but not exactly cordate, these two articulations broadly dilated inwardly and furnished underneath at the inner side with patches of grey sponge-like vestiture.

♂. Length $5\frac{1}{2}$; breadth $1\frac{1}{4}$ lines.

Preservation Inlet (*Mr. Hansen*). One individual.

Obs.—The structure of the male anterior tarsi in this and my *D. punctipenne* (no. 1768) proves that Dr. Sharp's genus is not only perfectly distinct, but that it is differentiated by structural characters that cannot well be mistaken. He, no doubt, had seen female specimens only when instituting *Diglymma*.

SNOFRU, gen. nov.

Body cylindric. Allied to *Diglymma*.

Mentum tooth large, grooved, but not distinctly duplicate, strongly bisetose at base. *Maxillary palpi* with subcylindric terminal joints, truncate at apex. *Labial* of about similar length, penultimate joint strongly bisetose, the terminal about as long as that of the maxillary, moderately slender at its base, considerably dilated beyond, narrowed but not acuminate at the extremity; if the apical portion were removed the joint would be securiform. *Scroba* of mandibles setiferous. There is but one ocular seta; each side of the thorax

bears three or four setæ. *Labrum* prominent, obliquely rounded at each side in front, so that it is notched medially. *Tibiae* with simple external angles. *Tarsi* with lateral setæ only, basal four joints moderately dilated, cordiform. *Antennæ* pubescent from the fourth joint onwards.

In the generic diagnosis of *Diglymma* Dr. Sharp states that "the terminal joint of the palpi is more slender than in any other yet described New Zealand Broscini." The structure of the labial palpi of *Snofru* is therefore distinctive.

Snofru emulator, sp. n.

Elongate, transversely convex, subparallel, shining black; the legs, labrum, and mandibles piceous; antennæ and tarsi pitchy red.

Head narrower than thorax, nearly smooth, with a distinct ridge from the inner side of each eye to the base of the mandible; frontal impressions long and ill-defined; there is a transverse series of fine punctures in line with the constriction behind the eyes. *Thorax* about as long as it is broad, its sides finely marginated and only slightly curvate, rather more narrowed towards the base than in front, posterior angles obsolete; its median furrow well marked, but not attaining the base or apex, basal fossæ small, almost punctiform, situated close to the angles, the frontal and basal regions with some small scattered punctures. *Elytra* elongate, rather wider than thorax at the base, shoulders curvally narrowed, their sides very finely margined and but little rounded; their striae not at all deep, subinterrupted in places and finely punctured, interstices nearly plane, apex almost smooth, the lateral space on each with five or six coarse punctures. *Legs* moderately stout, the intermediate tibiae finely spinose.

Underside black, flanks of prosternum punctate, with a groove along the middle extending nearly to the extremity of the intercoxal process.

♀. Length $5\frac{1}{2}$; breadth $1\frac{1}{2}$ lines.

Otara, Southland.

One example, sent by Mr. A. Philpott in November 1894, has been held in reserve in the hope of obtaining some of the male sex.

Oopterus nigritulus, sp. n.

Oblong-oval, slightly convex, shining black; suture and margins of elytra rufescent, femora testaceous, tibiae, tarsi, and antennæ fusco-rufous.

Head (eyes included) as wide as front of thorax, frontal

impressions not well defined, the ridge between each and the sharply marked lateral sulcus rather broad; between the two frontal punctures there is an elongate fovea, and between the eyes a distinct puncture; the labrum is sanguineous. Thorax only an eighth broader than long, the middle widest but not markedly so, its sides rather finely margined and almost regularly, yet only moderately rounded, gradually and not sinuously narrowed behind, posterior angles straight but not acute; disk convex, feebly transversely striate, mesial groove shortened in front, basal fossæ large and broad, with a carina between each and the lateral margin, base subtruncate, apex slightly incurved. Scutellum smooth. Elytra oval, with broad margins; the sutural two striæ on each elytron distinct and seemingly impunctate, third and fourth fine, fifth and sixth nearly obsolete, being indicated only by fine punctures, these four striæ are hardly perceptible near the base and apex; the third interstices are bipunctate, the apical carina is well developed, and the four marginal punctures near each shoulder are distinct.

Underside glossy aeneo-fuscous, the sides of the ventral segments broadly fulvescent.

Differs from *O. sobrinus* in having the thorax transversely striate, by the presence of a central puncture between the eyes. The elytral margins disappear on reaching the front of the carina, in *O. sobrinus* the margins are broader behind and distinct almost to the extremity. In *O. nigritulus* the posterior tibiæ are slightly flexuous, and the elytral apices are narrower.

♀. Length 3; breadth $1\frac{1}{2}$ lines.

Palmerston North and Karori (Mr. G. V. Hudson). One specimen.

Oopterus frontalis, sp. n.

Nitid, piceous; the head, basal margins of thorax, the suture and lateral margins of elytra piceo-rufous; legs, palpi, and antennæ testaceous.

Head rather elongate, convex, smooth and shining, contracted laterally behind the eyes, which, though large and longitudinally oval, are but little prominent, the frontal impressions are deep and elongate. The antennæ reach beyond the base of thorax, basal joint rather slender, it and the second glabrous and yellow, remaining ones slightly rufescent and obviously pubescent. *Thorax* subquadrate, one-fourth broader than long, base truncate, apex incurved; its sides nearly straight and only slightly narrowed behind

the middle, moderately curvedly narrowed anteriorly, with fine distinct margins; the disk a little convex, its median groove distinct but not attaining the apex, basal fossæ well-marked and nearly duplicated, and extending inwardly towards the middle, there is an obtuse carina between each and the outer margin, the whole basal region is distinctly punctured; posterior angles exactly rectangular. *Scutellum* smooth. *Elytra* broadly oval, with explanate margins, which, however, become indistinct near the extremity; their sutural two striae, on each, are well marked and finely punctured, the others are finer and become obsolete near the sides and base, third interstices tripunctate, the posterior carina rather fine. There is a transverse series of four punctures near the extremity of the last ventral segment.

Readily distinguishable from *O. nigritulus* by the quadrate and obviously punctured thorax, much less convex eyes, deep elongate frontal impressions, and from all the other species by the flavescent antennæ with the rather slender basal articulation.

♀. Length $2\frac{1}{2}$; breadth $1\frac{1}{4}$ lines.

Wadestown and Palmerston North (Mr. G. V. Hudson).
One.

Oopterus sculpturatus, sp. n.

Suboblong, moderately convex, shining, piceous; the head and the suture and margins of elytra rufo-piceous; legs infuscate red; the palpi, tarsi, and basal two joints of antennæ rufo-testaceous, remaining joints fusco-rufous.

Head (the large but not very prominent eyes included) as broad as front of thorax, ovate; the frontal impressions though elongate are not well defined, owing to the gradual outward slope of the head. *Thorax* rather short, about a third broader than it is long, widest near the middle, moderately strongly rounded, rather gradually narrowed behind; posterior angles straight, not acute, but, nevertheless, appearing slightly prominent, reddish, with a rather coarse setigerous puncture, the seta itself yellow and unusually conspicuous; base truncate, apex slightly incurved; the discoidal sulcus not abbreviated but more slender at the extremities, basal fossæ large and transverse, disk moderately convex, with feebly impressed indistinct striae across it. *Elytra* broadly oval, about a third broader than the thorax in the middle, with well-developed lateral margins and channels; each elytron has a well-marked scutellar stria, the sulci nearest the suture are rather deep and relatively rather distinctly punctured, those near the side become finer, none,

however, are quite obsolete ; interstices slightly convex near the suture, the third tripunctate, posterior plica only moderately developed. There are two setigerous punctures on each side of the middle, at the apex, of the terminal segment.

With the exception of *O. latipennis* this is the most distinctly sculptured of all the larger members of the genus ; that species, however, may be recognized at once by the acutely projecting angles and punctate base of the thorax.

♂. Length $2\frac{3}{4}$; breadth $1\frac{1}{8}$ lines.

A single male, one of Commander J. J. Walker's numerous discoveries whilst serving on board H.M.S. 'Ringarooma.'

A second specimen has been labelled *O. ovinotatus*, having a large well-defined oval impression on the middle of the thorax, some fine transverse rugæ near the base, and more shallow and less laterally expanded basal foveæ, &c.

Group Anisodactylidæ.

Allocinopus ocularius, sp. n.

Elongate, slightly convex, nitid, black ; mandibles picco-rufous ; the legs, antennæ, and palpi testaceous ; the elytral margins, near apices, fusco-testaceous.

Head (including the large rotundate and prominent eyes) about as broad as the widest part of thorax, nearly as long as that is, much contracted behind ; it is smooth, with setigerous punctures as in *A. sculpticollis*, but with six instead of four on the labrum, the inter-antennal impressions not extending backwards as far as the middle of the eyes. *Thorax* one-fourth broader than long, widest just before the middle, moderately rounded towards the front, considerably sinuously narrowed backwards, posterior angles rectangular, but not acute ; base widely, but only slightly medially emarginate, apex incurved, lateral margins well developed ; dorsal groove well marked, but not attaining the base or apex ; basal fossæ of moderate size, from the inner side of each of these to the middle of each side the surface appears flattened or depressed and, as well as the middle, more or less finely punctate and rugose. *Elytra* oblong, rather wider than thorax at base, a good deal narrowed and slightly sinuate behind, apices individually rounded and slightly dehiscent at the suture ; with regular, well-marked, impunctate striæ, between the sutural and second striæ there is a short oblique basal one, thus forming an additional interstice there, the marginal punctures become irregular behind.

This interesting species, though similar to the typical one

in form and coloration, presents some important differences. The eyes are obviously larger and much more convex, so that the head seems different in form. The antennæ are inserted very close to the front of the eyes, and their basal articulation is much stouter. In *A. sculpticollis* the fourth joint of the anterior tarsi is excavate at the front face, in this species the excavation is less circular and extends a little further back.

♂. Length $4\frac{1}{4}$; breadth $1\frac{3}{8}$ lines.

Manawatu Flats, nine miles below the Gorge.

One, amongst other beetles collected by Mr. W. W. Smith and Mr. Frank Park.

Group Anchomenidæ.

Dicrochile thoracica, sp. n.

Subdepressed, head and thorax glossy black, elytra less shining, legs piceous, palpi, antennæ, and tarsi rufescent.

Head broadly oval, rather narrower than thorax, uneven; the groove between the eye and antenna rather broad and deep, there is a slight longitudinal groove on the vertex, and some distinct oblique rugæ and two foveiform impressions between the eyes. *Thorax* $2\frac{1}{2}$ mm. long and broad, widest before the middle, gently rounded towards the prominent but obtuse anterior angles, its sides nearly straight yet gradually narrowed backwards, posterior angles obliquely rounded; base slightly, the apex deeply, incurved; lateral margins reddish, reflexed, more strongly behind; median furrow well marked, at each side a broad depression extends towards the middle, the base is minutely wrinkled, there are several abbreviated striæ before the oblique frontal impressions, and the disk itself is faintly transversely striate. *Elytra* oblong-oval, obliquely sinuate posteriorly, apices obtusely rounded; their striæ are distinct and regular but quite impunctate, scutellar striæ very distinctly impressed, interstices almost flat, the third with two small punctures.

The nearest ally is *D. subopaca*, in *D. thoracica*, however, the thorax is relatively longer and narrower, more deeply emarginate in front, the anterior angles though obtuse are more prominent, the elytra are longer and appear narrower, whilst the scutellar striæ are broader and deeper.

♀. Length $5\frac{1}{2}$; breadth 2 lines.

Broken River.

One individual from Mr. J. H. Lewis.

Anchomenus macrocaelis, sp. n.

Subdepressed, subopaque, black; legs piceous; palpi, mandibles, antennæ, and tarsi dark infuscate red.

Thorax subquadrate, a fifth broader than long, a little wider before the middle than elsewhere, base truncate, apex widely but not deeply emarginate, so that the anterior angles are slightly prominent; its sides gradually narrowed but hardly perceptibly sinuated behind, moderately rounded anteriorly, posterior angles rectangular; the central furrow extends from base to apex, the former is longitudinally strigose, the front impression not well marked, the disk feebly transversely striate; basal fossæ very large, occupying almost the whole area from the lateral margins to near the central groove and prolonged forwards to the middle, and continued still further as a narrow shallow impression near each side. *Elytra* oblong-oval, slightly wider behind the middle than elsewhere, distinctly narrowed towards the rounded shoulders, a good deal obliquely contracted posteriorly, apices rounded; their striæ fine, but distinct and apparently quite impunctate, interstices broad, nearly flat, the third rather feebly tripunctate.

This is closely allied to *A. otagoensis*; the coloration differs and the basal thoracic impressions are materially different, as in that species they are simple though large foveæ with shallow anterior prolongations.

♂. Length 5½-6; breadth 2 lines.

The Hermitage, Mount Cook.

Two males from Mr. H. Suter.

Anchomenus xanthomelus, sp. n.

Glossy, nigro-piceous; the labrum, mandibles, and margins of thorax and elytra rufescent; antennæ, palpi, and legs flavescent, sometimes pallid.

Head ovate, smooth, with well-marked frontal impressions. *Thorax* cordiform, slightly longer than broad, widest at the middle, moderately rounded towards the obtuse anterior angles, much sinuated behind; at the base, however, the sides are straight, with acutely rectangular angles; basal fossæ large and deep and extending forwards as curvate impressions which become obsolete towards the front; basal region depressed, the longitudinal groove well-marked medially, but less so near the base and apex; the curvate frontal impression feeble; there are several short longitudinal striæ near the basal margin. *Elytra* oval, obliquely

sinuate posteriorly, apices slightly prolonged, shoulders rounded; they are evidently striate, the striae, however, are scarcely perceptibly punctured, interstices slightly convex, the third tripunctate. *Tarsi* with two grooves above and another along each side.

In *A. helmsi* the elytra are more narrowed posteriorly, with more prolonged apices. *A. sandageri* may be recognized by the projecting base of the thorax: the front tarsi also differ; in *A. sandageri* the second joint is quite oblong, whereas in this species the corresponding joint, as well as the third, is much narrowed towards the base.

♂. Length $4\frac{1}{4}$; breadth $1\frac{3}{4}$ lines.

Manawatu Gorge.

One, discovered by Mr. W. W. Smith.

Anchomenus intermedius, sp. n.

Body rather elongate, nitid, piceo-niger; margins of thorax and elytra fusco-rufous; legs pale testaceous; the palpi, tarsi, and basal three joints of antennæ fulvescent, remaining joints fusco-rufous and opaque.

Head ovoid, smooth, inter-antennal impressions moderate; labrum widely incurved. *Eyes* large and prominent. *Antennæ* elongate, attaining the middle thighs, third joint slightly longer than fourth. *Thorax* apparently elongate, in reality one-sixth broader than long, rather wider before the middle than elsewhere, moderately rounded towards the obtuse front angles, slightly and gradually narrowed backwards, posterior angles rectangular but not acute, base subtruncate, apex a little incurved; discoidal groove well marked throughout, the angulate frontal impression more or less distinct; basal fossæ large, prolonged, but becoming shallow halfway along each side, so that the lateral margins seem elevated behind; the disk convex, with feeble striae across it, sometimes there are longitudinal rugæ at the base. *Elytra* elongate, oblong-oval, moderately convex, the sutural region somewhat elevated posteriorly; with well-developed, very finely punctured striae, interstices broad and slightly convex, the third tripunctate.

Legs long and slender; the anterior tarsi of the male but little expanded, basal two joints oblong, third shorter than second and more narrowed towards its base, fourth deeply emarginate, the two hind pairs distinctly grooved.

Just intermediate between *A. integratus* and *A. xanthomelus*. The thorax is more like that of the former, but differs in being less sinuate behind; whilst the elytra, instead

of being broad and subdepressed, as in *A. deplanatus* and *A. otagensis*, are convex and very elongate. In *A. xanthomelus* the sides of the thorax are deeply sinuate-angustate behind, the clytra are less elongate, less narrowed basally, and have more sharply impressed striae. The apical sinuosities, too, are different; in *A. intermedius* the narrowed portion is longer and more oblique, and the sutural region is elevated posteriorly.

This, as well as the preceding and following species, are much alike in coloration, so that all three form a yellow-legged homogeneous series that may thus be separated from the older species without much trouble.

♂. Length $5\frac{1}{2}$; breadth 2 lines.

Manawatu Flats, 9 miles below the Gorge.

Mr. Frank Park discovered the two specimens.

Anchomenus integratus, sp. n.

Subdepressed, shining, nigrescent; lateral margins, scutellum, and labrum rufescent; legs flavous; tarsi and antennæ fulvescent, mandibles red.

Head oviform, labrum incurved. *Thorax* subcordate, of equal length and breadth, widest before the middle, evidently rounded there, distinctly sinuously narrowed behind, posterior angles rectangular; the surface almost smooth, its median furrow rather fine and not extending beyond the frontal impression; basal fossæ deep and elongate, but not distended more than halfway towards the middle of the base; a shallow curvate impression proceeds from each towards the front. *Elytra* oblong-oval, nearly twice the width of the thorax, widest behind the middle, moderately sinuated posteriorly, apices broadly rounded so as to appear subtruncate; obviously striate, the striae finely and indistinctly punctured; interstices plane, the third with two, or three, punctures.

Intermediate between *A. otagensis* and *A. helmsi*, distinguished from the former by the more sinuated sides of the thorax, the more prominent hind angles, and larger basal foveæ; from the latter by the broader and more depressed elytra and obtuse apices. From both of these species it is also differentiated by the colour of the limbs and feeble grooving of the tarsi.

♀. Length $4\frac{3}{4}$ lines; breadth $1\frac{7}{8}$ lines.

Broken River, Canterbury.

One, mutilated, from Mr. J. H. Lewis.

Anchomenus sophronitis, sp. n.

Body picco-niger, slightly nitid; antennæ, palpi, and legs rufescent.

Head broadly oviform, the vertex seems convex, owing to two curved frontal depressions uniting with the lateral furrows; labrum red, widely incurved. *Thorax* subquadrate, about one-sixth broader than long, widest at, or before, the middle, rounded there, moderately narrowed towards the front, with a long but not deep sinuation behind, the sides near the base almost straight, posterior angles rectangular but not acute; its surface obsoletely transversely striate, basal foveæ large, prolonged forwards and gradually becoming fainter; the longitudinal sulcus passes the frontal impression, but in the male does not reach the smooth base; in the female the base is not perfectly smooth. *Elytra* oblong-oval, a little transversely convex; posterior sinuosities long but not deep, apices obtusely rounded; their striae distinctly impressed and very finely punctured, the sides behind the posterior femora somewhat explanate and rufescent; interstices very slightly convex, the third tri-punctate.

Male.—Anterior *tarsi* grooved above, second joint oblong, narrowed towards its base, third subcordate; the two hind pairs distinctly grooved. Apex of terminal ventral segment with two setigerous punctures at each side of the middle.

Female.—*Tarsi* distinctly grooved, three punctures each side of last segment, elytral apices subtruncate.

The rather definite limitation of the vertex in front, the more convex hind body with deeper sulci, and the structural difference in the third tarsal joint of the male are good distinguishing characters for its separation from *A. otagoensis*, in which the third joint of the anterior tarsus of the male is quite oblong.

Length 5; breadth 2 lines.

West Plains, Invercargill.

One pair from Mr. A. Philpott in October 1894.

*

Ctenognathus littorellus, sp. n.

Body black; head and thorax somewhat glossy, elytra less so, labrum and mandibles red; antennæ, palpi, and legs rufo-testaceous.

Head oviform, small, vertex moderately convex, frontal impressions well marked. *Thorax* cordate, length and breadth equal, widest at the middle, rounded there, moderately

narrowed anteriorly, deeply sinuate behind the middle, but near the base the sides are straight, posterior angles rectangular but not acute; the disk broadly depressed longitudinally, the central groove extends from the base to the oblique frontal impressions; the marginal channels seem deep, owing to the reflexed rims; basal fossæ large and deep, extending forwards as curvate impressions nearly to the apex; at the inner side of each of these, at the middle, there is another but shorter impression, the base is closely longitudinally striose, the disk has indistinct transverse striae. *Elytra* oval, the lateral margins forming a gentle unbroken curve to the posterior angles of the thorax, at which point the margins are also well developed; they are a good deal obliquely narrowed posteriorly, the apices are rather sharply rounded, but not prolonged individually, thus causing a slight sutural gap; they are regularly and deeply striate, with fine, rather indistinct punctures; interstices slightly convex, quite impunctate; the short scutellar striae are well marked.

Tarsi setose, basal three joints of the anterior oblong, narrowed towards the base, decreasing in length and slightly grooved above, the hind pairs distinctly grooved.

At first sight I thought this might be only a southern form of *C. pictonensis*, Sharp, but there is no prolongation of the elytral apices; the punctuation of the striae, though fine, is quite perceptible, and there are no interstitial punctures. In *C. adamsi* the basal thoracic angles are more prominent, but the elytral margins do not extend as far inwards at the base, and their striae are impunctate.

♂. Length $5\frac{1}{4}$; breadth 2 lines.

Invercargill.

Two found by Mr. A. Philpott under driftwood at the seaside.

Tarastethus southlandicus, sp. n.

Glossy, nigro-piceous; legs and elytral margins rufescent; the antenæ, palpi, and tarsi rufo-testaceous.

Head obviously narrower than thorax, frontal impressions distinct. *Eyes* large but not very prominent, finely but distinctly facetted. *Thorax* nearly as long as broad, base and apex truncate, lateral margins well developed; widest near the middle, strongly rounded anteriorly, a good deal sinuously narrowed backwards; posterior angles rectangular and slightly prominent; disk convex, its central furrow does not reach the apex; basal impressions somewhat elongated, situated midway between the middle and sides and causing

a slight flattening of the base inwardly ; the fine punctuation at the base extends to the lateral margins, but the middle, though slightly uneven, is less evidently punctured. *Elytra* convex, much broader than thorax, widest before the middle, considerably narrowed behind; the shoulders, though rounded and narrowed, are distinctly wider than the base of the thorax ; their striæ are rather shallow and finely punctured, but become deeper, yet less evidently punctured, posteriorly ; the apical carina is well developed. The *antennæ* reach backwards to beyond the thorax, their third joint is rather longer than the fourth, and the terminal is distinctly longer than the tenth. There is a minute seta at each hind angle of the thorax.

When compared with *T. leviventris*, no. 1800, the posterior sinuosity at each side of the thorax is seen to be deeper and the angles more projecting ; the hind body broader, with more explanate lateral margins and wider channels to within a very short distance from the very slight incurvature near the apex, and that the posterior plica extends forwards to the hind thighs. The thoracic basal impressions and punctuation also are quite different.

Length nearly $2\frac{1}{4}$ lines ; breadth $1\frac{1}{8}$ lines.

Invercargill.

One example from Mr. Alfred Philpott.

Tarastethus carbonarius, sp. n.

Compact, nitid, black ; legs rufous, tinged with piceous ; tarsi, palpi, and antennæ fulvescent.

Head (including the eyes) as broad as front of thorax ; frontal impressions elongate and minutely punctured, with a single seta near the back of each eye. *Thorax* nearly as long as it is broad ; base truncate, apex slightly incurved ; its sides finely margined and moderately rounded, rather wider near the middle than elsewhere, moderately sinuate behind, posterior angles a little prominent but not acute ; its base resting on the elytra, the discoidal groove seemingly finely punctate but not attaining the base or apex ; basal foveæ apparently absent, but represented by elongate feeble impressions only, its surface without distinct sculpture. *Elytra* oblong, with slightly reflexed rims and somewhat concave lateral channels, their sides only slightly curved ; apex broadly rounded, the base finely margined and distinctly wider than thorax ; the sutural two striæ on each well marked, quite deep behind and finely punctate ; third to sixth distinct behind, mere series of fine punctures on the

disk and becoming obsolete towards the base; the interstices broad, plane, and smooth, the seventh distinctly carinate behind.

There is but one species like this—*T. marginalis*, no. 1329. It has a more transverse thorax; the humeral angles are more rounded, so that the base of the thorax seems as wide, or almost as wide, as they are. The elytral channels and margins are wider; the thoracic dorsal groove is deeper, and the other sculpture differs, the sutural striae only of the elytra attain the apex, the others becoming obsolete there; it has two ocular setæ.

In *T. carbonarius* there is but one seta, placed close to the inner and back part of each eye, and this seems to arise from a minute swelling instead of a distinct puncture. The posterior tibiae are slightly arched. In *T. marginalis* the hind margins of the thorax are thickened and flattened near the posterior angles.

♀. Length $3\frac{1}{4}$ lines; breadth $1\frac{3}{8}$ lines.

Manawatu Flats, nine miles below the Gorge.

One female, amongst other Carabidae, collected by Mr. W. W. Smith and Mr. Frank Park.

[To be continued.]

XXXVIII.—New African Phlebotomine Diptera in the British Museum (Natural History).—Part V. Tabanidæ (continued). By ERNEST E. AUSTEN *.

TABANINÆ.

HIPPOCENTRUM †, gen. nov.

Allied to Hæmatopota ‡, Mg., but distinguished by the head (at least in the ♀) being wholly or for the most part

* For Parts I.-IV. see Ann. & Mag. Nat. Hist. ser. 8, vol. i. pp. 209-228 and 401-428, and vol. ii. pp. 94-110 and 274-301.

† ἵππος, a horse; κέντρον, a horse-goad.

‡ I do not propose to follow Dr. Kortész ('Catalogus Dipterorum hucusque Descriptorum,' vol. iii., Budapestini, 1908, p. 201) in adopting as the designation of this well-known genus the name *Chrysozona*, Mg. ('Nouvelle Classification,' 23, 34, 1800), which, although actually possessing three years' priority over *Hæmatopota*, was, so to speak, *still-born*, i. e. never entered into common use, and for more than a century has remained buried in oblivion. This is surely a typical instance of a case in which the rules of strict priority should be disregarded in favour of expediency and common-sense!

shining, by the antennæ (at any rate in the ♀) being extremely slender and the first joint elongate, by the terminal joint of the palpi in the ♀ being very large and shining on the outer side, which is strongly convex, while the inner side is flattened, and by the wings, though more or less suffused with dark colour interrupted by pale streaks or blotches, being without the peculiar light markings characteristic of *Hæmatopota*.

Head wide, convex in front, posterior surface flattened and excavated; anterior region of front somewhat tumid, but *frontal callus*, as seen in *Hæmatopota*, Mg., only partially developed or wanting; antennæ not situate on a well-marked tubercle or prominence; median region of face somewhat prominent; eyes bare, and in ♀ consisting of small facets of equal size; first joint of *palpi* slender, terminal joint in ♀ somewhat like an isosceles triangle in outline when viewed from outer side, with upper margin convex; first joint of antennæ cylindrical, not at all incrassate, usually more or less curved inwards, six to seven times as long as second joint, which is of usual shape (in typical species very small), and without a prominent angle above or below, third joint slender and elongate, without a prominent angle on upper side near base, terminal portion of third joint consisting of three annuli, last annulus approximately equal in length to the two preceding annuli taken together, first and second joints of antennæ taken together about two-thirds of length of third joint; *proboscis* as in *Hæmatopota*. Body narrow and elongate, hairy covering short and inconspicuous; dorsum of *thorax* without or with no conspicuous markings; *scutellum* small, bluntly triangular, not inflated. Wings: venation as in *Hæmatopota*; upper branch of third longitudinal vein with or without an appendix, which, if present, may be exceedingly small.

Typical species, *Hippocentrum versicolor*, sp. n.: *Hæmatopota strigipennis*, Karsch (Ent. Nachr. xv. 1889, p. 240), described from the Gaboon, and *H. trimaculata*, Newstead ('Annals of Tropical Medicine and Parasitology,' i. 1907, p. 42, pl. iv. fig. 2), described from the Congo Free State, also belong to this genus.

In the shape and size of the terminal joint of the palpi the present genus resembles *Thriambutes*, Grünberg ('Zoologischer Anzeiger,' xxx. Bd. 1906, pp. 352-353, fig. 4), which was founded for *Thriambutes singularis*, Grünb. (*loc. cit.* p. 353), from Togoland, W. Africa. *Thriambutes*, however, belongs to the Pangoniæ, and consequently has spurs at the tips of the hind tibiae; apart from this, *Hippo-*

centrum can at once be distinguished from Grünberg's genus by, *inter alia*, the elongate and slender first antennal joint, which is six or seven instead of only three times as long as the second joint, and by the antennæ not being situate on a prominent tubercle. In the shining face, expanded and shining terminal joint of the palpi, and coloration of the wings the new genus exhibits resemblances to the Neotropical *Lepidoselaya*, Macq., from which, however, it is readily distinguishable owing to the elongate shape of the body, the length of the first joint of the antennæ, and the non- or scarcely incrassate front tibiae, which in *Lepidoselaya* are enormously swollen.

Hippocentrum versicolor, sp. n.

♀.—Length (9 specimens) 7 to 9 mm.; width of head 2·4 to 2·8 mm.; width of front at vertex 1 mm. to just over 1 mm.; length of wing 7·25 to 8·75 mm.

Body dusky, wings variegated, tibiae for most part buff or cream-buff.*—*Dorsum of thorax blackish, covered with greyish dust; scutellum and abdomen clove-brown, second, third, and fourth abdominal segments each with a more or less deep though not very distinct greyish hind border; wings for most part dark brown, but with large hyaline or milky streaks or blotches, extreme base and costal cells ochre-yellow.*

Head: front, face, and jowls shining clove-brown, a more or less distinct tawny-olive band sometimes visible immediately below antennæ, extending from eye to eye; upper half of front pearl-grey pollinose; in rubbed specimens pollinose area may appear to be confined to a somewhat curved transverse band, occupying a depression above the more or less tumid anterior half of the front, which forms an ill-defined *callus* of considerable depth, lower portion of which extends from eye to eye and has a nearly straight lower margin, while upper portion is subtriangular; in middle line immediately below callus, with which it is in contact, is a small dull clove-brown spot (as exhibited by so many species of *Hæmatopota*), sometimes difficult to distinguish, situate between callus and base of antennæ; terminal joint of *palpi* clove-brown, clothed on outer side for most part with minute and inconspicuous dark brown hairs; first and second joints of *antennæ* pale mummy-brown or raw umber-coloured, second joint and distal half of first some-

* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1880).

times darker, third joint dark brown, lighter at extreme base. *Thorax*: dorsum sparsely clothed with minute and deciduous yellowish hairs, in front with traces of a pair of widely separated greyish longitudinal stripes, not extending beyond transverse suture. *Abdomen*: dorsum sparsely clothed with minute, appressed, dark brown hairs, and with similar pale yellow hairs on hind borders and posterior angles of second, third, and fourth segments; grey hind borders of second to fourth segments inclusive more or less expanded on sides; venter shining clove-brown, extreme hind margins of second and following segments cream-coloured, ventral surface of second segment sparsely clothed with minute appressed pale yellow hairs, that of following segments clothed with dark brown or blackish hairs. *Wings*: dark brown, except extreme base and costal cells, which are ochre-yellow, a large hyaline area, which includes both basal and bases of first submarginal, first posterior, and discal cells, a second hyaline area, including alula and anal angle, though rudiment of seventh longitudinal or axillary vein is usually marked by a brownish streak, a broad milky streak extending diagonally backwards from costa just beyond stigma and either terminating in distal extremity of discal cell or else just reaching fourth posterior cell, and a large triangular, quadrate, or ovoid milky spot, situate on hind margin in fifth posterior cell, and looking like a continuation of the diagonal streak; dark brown area thus includes distal third, with its proximal margin oblique, a blotch occupying distal half of axillary cell, whole of anal cell except extreme base, and rather more than basal half of fifth posterior cell, and fusing with apical blotch in fourth posterior cell; there is also a broad dark brown streak, which runs obliquely downwards from lower margin of stigma, crosses discal cell, and becomes merged with the larger brown area in the fourth posterior cell; *stigma* elongate, ochre-yellow at its proximal, dark brown at its distal extremity. *Halteres*: stalk cream-buff, knob cream-coloured. *Legs*: front coxae clove-brown, greyish pollinose; front and middle femora dark brown, front femora sometimes paler (mummy-brown), hind femora clove-brown; front tibiae slightly expanded towards tips, but not really incrassate, hind tibiae not incrassate; tips of front tibiae dark brown or front tibiae except base sometimes wholly brown, middle tibiae wholly buff, hind tibiae brown or brownish on inner side, or more or less brown except at base; front tarsi dark brown, middle and hind tarsi brown, with first joint, except tip, and bases of two following joints buff or cream-buff.

Northern and Southern Nigeria ; Uganda : type and three other specimens from Lagos, S. Nigeria, taken on railway at 57½ miles camp, 12. vi. 1906, "very troublesome to horses" (Dr. R. C. Hiscock, per Dr. W. H. W. Strachan, C.M.G.) ; additional specimens from the Lower Niger, S. Nigeria, vii. 1906 (G. C. Dudgeon) ; Akwutcha, Bassa Province, N. Nigeria, July 1906 (Dr. G. J. Pirie) ; Zungeru, Zaria Province, N. Nigeria, 14. vii. 1905 (Dr. Dalziel, per Dr. J. H. Ashworth), and July 1907 (J. Brand) ; Little Koriga River, N. Nigeria, 18. vii. 1907 (J. Brand) ; and the Nile Province, Uganda, 1906, "caught on a native in camp ; only specimen seen" (the late Dr. W. A. Densham).

Hippocentrum versicolor can easily be distinguished by the markings from *Hippocentrum trimaculatum* (*Hæmatopota sulata*), Newstead (? = *Hæmatopota strigipennis*,

♀.—Lr
2·4 to 2·9
1 m.

XXXIX.—*Descriptions of Three new Cyprinoid Fishes from Yunnan, collected by Mr. John Graham.* By C. TATE REGAN, M.A.

Acanthorhodeus elongatus.

Depth of body 3 to 3½ in the length, length of head 4 to 4½. Snout shorter than eye, the diameter of which is 2½ in the length of head and greater than the interorbital width. Mouth terminal, very oblique ; no barbels. 36 to 38 scales in a longitudinal series, 5 to 6½ in a transverse series from origin of dorsal fin to lateral line, 4 or 5 between lateral line and base of pelvic fin. Dorsal II 11-13 ; second spine ¾ to ¾ the length of head, shorter than the anterior branched rays ; free edge of the fin concave. Anal II 10-11 (12). Pectoral sometimes reaching the pelvics, which extend nearly or quite to the anal. Silvery ; back olivaceous ; a bluish lateral stripe ; males with the anal fin blackish.

Hab. Yunnan Fu.

Several specimens, 55 to 70 mm. in total length.

Using L. S. Berg's valuable synopsis of the Rhodeines (Ann. & Mag. Nat. Hist. (7) xix. 1907, p. 106), this species is found to be nearest to *A. atranalis*, Günth., from which it differs notably in the elongate body and the very oblique terminal mouth.

Berg distinguishes *Acanthorhodeus* from *Achilognathus* by the pharyngeal dentition, the former being defined as having

the teeth deeply serrated, whilst in the latter they are said to be entire. It seems doubtful whether the divisions based on this character are more natural than those founded on the presence or absence of spinous rays in the dorsal and anal fins. The recently described *Acanthorhodeus gracilis*, Regan (P. Z. S. 1908, p. 60), from Corea, has the pharyngeal teeth distinctly but not deeply serrated.

Barilius grahami.

Dorsal fin with 7 branched rays, anal with 11. About 60 scales in a longitudinal series. In other characters extremely similar to *B. polylepis*, Regan, and *B. andersoni*, Regan.

Hab. Chenkiang Lake, 90 miles S.E. of Yunnan Fu.

Six specimens, which had been dried, 100 to 120 mm. in total length.

Nemachilus oxygnathus.

Depth of body 8 to 9½ in the length, length of head 5 to 5½. Snout as long as postorbital part of head. Diameter of eye 6 in the length of head, a little greater than the interorbital width. Breadth of head 2 in its length and more than its depth. Mouth formed as in *N. berezowskii*, Günth., the praemaxillaries forming a pointed symphyseal projection; maxillary barbel 1½ the diameter of eye. Valve between the nostrils produced into a short barbel. Body covered with small scales behind the level of the dorsal fin; further forward rudimentary scales on the sides; lateral line complete. Dorsal 11, with 9 branched rays; origin nearer to end of snout than to base of caudal; longest ray shorter than base of fin; free edge slightly convex. Anal 7, with 5 branched rays. Pectoral extending about ½ the distance from its base to the pelvics, which are 8-rayed, are inserted below the first branched ray of the dorsal, and extend about ½ of the distance from their base to the origin of anal. Caudal rounded. Caudal peduncle nearly as long as or a little longer than the head and about twice as long as deep. Body with 15 dark brown cross-bands, about as wide as the interspaces between them; 5 bands on the caudal region; dorsal rays with 2 or 3 series of dark spots.

Hab. Yunnan Fu.

Two specimens, 102 and 131 mm. in total length.

The closely allied *N. berezowskii*, Günth., 1896, from Southern Kansu, has a shorter head (6 in the length) and more numerous cross-bands (9 on the caudal region).

XL.—Description of a new Loricariid Fish of the Genus Plecostomus from Argentina. By C. TATE REGAN, M.A.

Plecostomus tenuiatus, sp. n.

Depth of body 5 to $5\frac{1}{2}$ in the length, length of head $3\frac{2}{3}$ to $3\frac{3}{4}$. Head as broad as long and $1\frac{1}{2}$ as long as deep. Diameter of eye 8 to 9 in the length of head, interorbital width $2\frac{1}{4}$, length of snout $1\frac{1}{2}$. Length of mandibular ramus 2 in the interorbital width; 30 to 36 teeth on each side in both jaws. Barbel about $\frac{1}{3}$ the diameter of eye. Snout broad, obtuse; supraorbital edges not raised; temporal plates not keeled; supraoccipital without median ridge, bordered posteriorly by 4 or 5 scutes; occipital process short. Scutes spinulose, not carinate, 31 in a longitudinal series, 8 between dorsal and adipose fin, 15 or 16 between anal and caudal. Lower surface of head and abdomen covered with small granular scales. Dorsal I 7, the first ray a little longer than the head and when laid back extending to the fifth scute behind the last ray, which is a little more than $\frac{1}{2}$ as long as the first. Length of base of dorsal equal to its distance from posterior end of spine of adipose fin. Anal I 4. Pectoral spine extending to anterior $\frac{1}{3}$ of pelvic fin. Caudal emarginate, the middle rays nearly $\frac{2}{3}$ as long as the longest. Caudal peduncle $3\frac{1}{2}$ as long as deep. Head with numerous small dark spots; sides of body with three or four dark longitudinal stripes, each occupying the upper and lower parts of adjacent series of scutes; dorsal and paired fins with some dark spots; caudal dusky.

Hab. Rio La Plata.

Two specimens, 260 mm. in total length, received for determination from the Berlin Museum. One of these has been retained for the British Museum Collection.

XLI.—Descriptions of new Fishes from Lake Candidius, Formosa, collected by Dr. A. Moltrecht. By C. TATE REGAN, M.A.

Gymnostomus labiatus.

Depth of body equal to the length of head, 4 in the length of the fish. Snout not projecting beyond the upper lip, nearly as long as the postorbital part of head. Diameter of

eye 5 in the length of head, interorbital width 3. Width of mouth a little less than $\frac{1}{2}$ the width of head; sheath of lower jaw with rounded anterior edge; lower lip thick, divided into two lobes by a deep anterior notch; posterior edge of lower lip narrowly interrupted medianly; 4 barbels, the posterior twice as long as the anterior and $1\frac{1}{4}$ as long as the eye. 41 scales in a longitudinal series, $5\frac{1}{2}$ in a transverse series from origin of dorsal fin to lateral line, 3 between lateral line and base of pelvic fin. Dorsal 11, with 8 branched rays; origin equidistant from end of snout and base of caudal; first branched ray the longest, a little longer than the base of the fin. Anal 8, with 5 branched rays. Pectoral $\frac{2}{3}$ the length of head, not reaching the pelvics, which are inserted below the anterior part of dorsal. Silvery; back darker; six dark vertical bars on each side; membrane of dorsal fin blackish.

A single specimen, 137 mm. in total length.

Opsariichthys barbatus.

Pharyngeal teeth 1.4.5—5.4.1. Depth of body $3\frac{1}{2}$ to 4 in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$. Snout longer than eye, the diameter of which is $4\frac{1}{2}$ to $5\frac{1}{2}$ in the length of head; interorbital width $2\frac{1}{2}$ to 3 in the length of head. Gape of mouth oblique, extending to below anterior $\frac{1}{2}$ of eye; on each side a short barbel at the corner of the mouth; lower jaw shorter than the upper; a notch in front of the preorbital, in advance of which the upper lip is partly covered by the skin of the snout. 52 to 58 scales in a longitudinal series, 12 or 13 in a transverse series from origin of dorsal fin to lateral line, 3 or 4 between lateral line and base of pelvic fin. Dorsal 10, with 7 branched rays; origin above base of pelvics; longest ray $\frac{1}{2}$ to $\frac{3}{4}$ the length of head; free edge a little convex. Anal 12, with 9 or 10 branched rays; middle rays prolonged in the adult. Pectoral shorter than the head, not reaching the pelvics. Caudal forked. Caudal peduncle $1\frac{2}{3}$ to $1\frac{3}{4}$ as long as deep. A dark lateral stripe expanding on the caudal peduncle; a vertically elongate blackish spot on each interradial membrane of the dorsal.

Four specimens, 98 to 160 mm. in total length; all are males with tubercles on the snout and suborbitals.

Although differing from other members of the genus in the presence of barbels, this species can scarcely be regarded as generically distinct from *O. pachycephalus*.

PARARASBORA, gen. nov.

Differs from *Rasbora* only in the structure of the mouth, the prominences on the lower jaw and the corresponding emarginations of the upper jaw being absent.

Pararasbora moltrechti.

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head $3\frac{2}{3}$ to $3\frac{3}{4}$. Snout as long or nearly as long as eye, the diameter of which is $3\frac{1}{2}$ to $3\frac{2}{3}$ in the length of head; interorbital width $2\frac{1}{2}$ to $2\frac{3}{4}$. Mouth oblique; jaws equal anteriorly; no barbels. 35 scales in a longitudinal series, $5\frac{1}{2}$ in a transverse series from origin of dorsal fin to lateral line, 2 between lateral line and base of pelvic fin. Dorsal 10, with 7 branched rays, above the space between pelvics and anal; free edge slightly concave. Anal 9, with 6 branched rays. Silvery; most of the scales on the sides with a dark vertical bar at the base.

Two specimens, 54 and 68 mm. in total length.

Liobagrus formosanus.

Depth of body 6 in the length, length of head $4\frac{1}{3}$. Head a little longer than broad; interocular width nearly 3 in the length of head. Jaws equal anteriorly; premaxillary band of teeth apparently about $2\frac{1}{2}$ as long as broad; posterior mandibular barbel extending to basal part of pectoral. Dorsal I 5; spine $\frac{1}{2}$ the length of head. Pectoral spine $\frac{1}{2}$ the length of the fin, which is $\frac{2}{3}$ the length of head. Anal 15. Caudal rounded. Greyish; fins dusky; anal and caudal with a narrow pale edge.

A single specimen, 37 mm. in total length.

This species is very near the Corean *L. andersoni*, Regan, 1908.

Salanx acuticeps.

Depth of body 11 in the length, length of head $5\frac{1}{2}$ to $5\frac{3}{4}$. Head 3 times as long as broad; snout acutely pointed, shorter than postorbital part of head; diameter of eye 8 in the length of head. Lower jaw not projecting, with a toothed pre dentary bone and with anterior canines which perforate the roof of the mouth; tongue toothless. Dorsal 13-14. Anal 26-27, originating below the second ray of dorsal. Pectoral with 9 or 10 rays; origin of pelvics nearer to anal than to base of pectoral.

Two specimens, 115 mm. in total length.

XLII.—*Twenty new Forms of Pteropus.*
By KNUD ANDERSEN.

FULL descriptions of the species and subspecies briefly diagnosed in this paper will appear in the new edition of the British Museum 'Catalogue of Chiroptera' now under preparation.

Pteropus hypomelanus canus, subsp. n.

Teeth averaging larger than in any other race of the species, except *Pt. h. lepidus*. Back, in the normal pale-coloured phase, pale mouse-grey, lightening to silvery whitish grey on rump, and with or without a distinct buffy suffusion; mantle some shade of hazel or chestnut; head similar to or brighter than mantle. Size as in *lepidus*.

Type. ♂ ad. skin and skull, Pulo Pandak, North Natuna Islands, Sept. 1894; collected by Ch. Hose; presented by the Tring Museum; B.M. 95. 11. 8. 3.

Specimens examined. Four, from the collections of the U.S. National (one *) and British Museums.

Range. North Natuna Islands: Pulo Panjang, P. Pandak, P. Laut.

Remarks.—This form is readily distinguished from *Pt. h. lepidus* by the conspicuously brighter tinge of the mantle and head.

Pteropus hypomelanus annexens, subsp. n.

Teeth not averaging larger than usual. Normal pale-coloured phase rather similar in colour to corresponding phase of *Pt. h. lepidus*, but generally more strongly suffused with golden ochraceous or paler or darker Prout's brown on back, and with brighter mantle and head. Forearm 130–134 mm.

Type. Imm. alc. and skull, Sirhassen, South Natunas, collected by A. Everett; B.M. 94. 9. 28. 25.

Specimens examined. Five, from the collections of the U.S. National (three †) and British Museums.

Range. Sirhassen, South Natuna Islands.

Remarks.—In characters as in habitat this race seems to occupy an intermediate position between *Pt. h. lepidus* (Tambelan Islands) and *Pt. h. tomesi* (Borneo); in the size of the teeth it accords with the latter form, in the colour of

* U.S. N. M. 104737; Pulo Laut, N. Natunas.

† U.S. N. M. 104732–34; Sirhassen.

the fur it approaches the former ; in the size of the skull it appears to average smaller than either.

Pteropus hypomelanus luteus, subsp. n.

The palest race of the species. Back, rump, and flanks same shade of brown (from nearly seal-brown to Mars-brown) ; head, mantle, throat, foreneck, breast, and belly ochraceous buff, buff, or cream-buff, with or without a brownish wash on throat and anal region. Forearm 128-136 mm.

Type. ♂ ad. skin and skull, Kiriwini Island, Trobriand group, 15th Feb. 1895 ; collected by A. S. Meek ; B.M. 96. 11. 5. 5.

Specimens examined. Seven, in the collection of the British Museum.

Range. New Guinea ; Conflict Is. (Itamarina) ; Trobriand group (Kiriwini) ; Woodlark I.

Remarks.—The difference in colour between *Pt. h. luteus* and any of the western races of the species (*geminus*, *enganus*, *condorensis*, *canus*, *lepidus*, *annectens*, *tomesi*) is very great, but the gap is completely overbridged by those races which, step for step, through the Philippines (*cayayanus*), Celebes (*macassaricus*), and the Gilolo group (*hypomelanus*), lead, in colour as in geographical habitat, up to *luteus*. The intimate relationship between all these forms is further shown by the fact that, save in the colour of the fur, they are in all respects (in skull, teeth, ears, quality, distribution, and length of fur, and external dimensions) indistinguishable from each other, except *enganus*, which averages smaller, *canus* and *lepidus*, in which the teeth average larger, and *annectens*, in which the skull averages smaller.

Pteropus satyrus, sp. n.

Allied to *Pt. hypomelanus*, but with smaller eyes and longer fur. Diameter of orbit 12·2 mm., against 12·7-13·2 in all forms of *Pt. hypomelanus* ; length of fur of back 18-19 mm., against 10-14 mm. in *Pt. hypomelanus*.—Back and rump blackish seal-brown, thinly and evenly sprinkled with pale greyish hairs, producing the general effect of a blackish colour slightly lightened with greyish. Centre of breast and belly golden buffy (type) or nearly cream-buff (paratype) ; sides of breast and belly, anal region, and flanks blackish very slightly sprinkled with pale greyish. Mantle chocolate (type) or between cinnamon and russet (paratype), these colours gradually darkening on sides of neck and fore-neck to dark chocolate (type) or russet (paratype). Crown

and sides of head mixed blackish, buffy, and pale greyish; throat blackish. Forearm about 139 mm.

Type. ♂ ad. skin and skull, Narcondam, Andaman Islands, Oct. 1904; presented by C. G. Rogers, Esq.; B.M. 6. 9. 1. 1.

Specimens examined. Two, in the collection of the British Museum.

Range. As yet only known from Narcondam, North Andamans.

Remarks.—This species probably replaces *Pt. hypomelanus* in the Andaman Islands. From the geographically nearest race of that species, *Pt. hypomelanus geminorum* (Mergui Archipelago), it differs chiefly in the conspicuously longer fur, the lesser amount of greyish admixture in the colour of the fur, the bright-coloured centre of breast and belly, and the slightly smaller eyes.—In general colour *Pt. satyrus* approaches the Andaman representative of the *Pt. melanotus* group, viz. *Pt. tyleri*, from which it is easily distinguished by the smaller size, much smaller skull and teeth, and less developed posterior basal ledges of premolars and molars.—In the Nicobars it is replaced by a distinct species, *Pt. faunulus*.

Pteropus colonus, sp. n.

Allied to *Pt. hypomelanus*, but much smaller. Forearm 109–114 mm.

Back and rump Prout's brown, rather thinly and inconspicuously sprinkled with greyish-white hairs. Breast, belly, and flanks dark Prout's brown (type) or Mars-brown (paratype), thinly (type) or thickly (paratype) sprinkled with greyish-white hairs. Mantle and sides of neck strongly contrasting with back, cream-buff slightly washed with ochraceous buff; foreneck similar, but considerably darkened by admixture of brownish. Crown and occiput similar to mantle, the colour passing gradually into a darker shade on sides of head, and this in turn into dark brownish on throat.

Type. ♀ ad. skin and skull, Alu, Shortland Island, Solomon Islands, April 1886; collected by C. M. Woodford, Esq.; B.M. 87.1.18.3.

Specimens examined. Two, in the collection of the British Museum.

Range. Shortland Island, West Solomons.

Remarks.—No doubt an eastern offshoot of *Pt. hypomelanus*. In the colour of the fur of the upperside it accords very

closely with the extreme eastern, New Guinea race of that species, *Pt. hypomelanus luteus*, differing chiefly in the smaller size, relatively shorter ears, and darker underparts.

Pteropus speciosus, sp. n.

Similar to *Pt. hypomelanus*, but skull considerably smaller; total length of skull about 57 mm., against 61–69 in all forms of *Pt. hypomelanus*. Back, in the ordinary phase, blackish conspicuously sprinkled all over with shining silvery whitish-grey hairs. Breast and front of belly orange-tawny; flanks and hinder belly similar to back. Mantle rich hazel, passing through a darker shade on sides of neck into chestnut on foreneck. Crown buffy, slightly mixed with blackish hairs; sides of head and throat mixed blackish and buffy grey. A blackish phase occurs. Externally smaller than any form of *Pt. hypomelanus* except *Pt. h. enganus*; forearm 120–123 mm.

Type. ♂ ad. alc. and skull, Malanipa Island, off Zamboanga ('Challenger' Expedition); presented by the Lords of the Treasury; B.M. 90. 2. 20. 4.

Specimens examined. Two, in the British Museum.

Range. Sulu Archipelago: Malanipa I., Sibutu I.

Pteropus mimus, sp. n.

Skull and teeth as in *Pt. speciosus*, colour of fur different. Back Vandyck-brown; rump similar, but washed with Mars-brown. Breast and belly pale golden ochraceous tinged with orange, heavily clouded with Mars-brown on breast and crissum, purer in tinge on belly; flanks dark Prout's brown, many hairs with tawny tips. Mantle rich ochraceous buff strongly tinged with orange (type), or between cinnamon and russet (paratype); sides of neck and foreneck nearly tawny. Crown similar to mantle; forehead and sides of head brownish mixed with buffy; throat seal-brown.

Type. ♀ ad. skin and skull, Macassar, S. Celebes; collected by Dr. A. R. Wallace; B.M. 7. 1. 1. 239 (Tomes Collection).

Specimens examined. Two, in the British Museum.

Range. Macassar, South Celebes.

Pteropus pelewensis, sp. n.

Allied to *Pt. admiraltatum*. General size of skull as in that species, but rostrum narrower, orbits smaller: maxillary width externally across m^1-m^1 14·8 mm., against 16–17 in.

Pt. admirabilitum; orbital diameter 11, against 12-12.5. Structure of teeth as in the allied species, but dentition on the whole slightly weaker, p_4 and m_1 markedly smaller. Fur shorter; approximate length on back 9-11 mm. (16-18 in *Pt. admirabilitum*). Colour of fur approaching that of *Pt. admirabilitum*. Forearm about 113 mm.

Type. ♂ ad. skin and skull, Pelew Islands; collected by Capt. Heinsohn (Godeffroy Museum); B.M. 74. 10. 5. 8.

Specimens examined. Two, in the British Museum.

Range. Pelew Islands.

Pteropus yapensis, sp. n.

Allied to *Pt. admirabilitum*. Size of skull as in that species, if not slightly larger, but temporal fossa much broader, zygomatic arches therefore much more flaring posteriorly (zygomatic width about 36 mm., against 32-33 in *Pt. admirabilitum*); frontal region between orbits broader; coronoid process markedly higher, coronoid height of mandible larger than $c-m^2$, but smaller than $c-m_3$, in *Pt. admirabilitum* subequal to $c-m^2$. Essential characters of dentition as in *Pt. admirabilitum*, but p^3 and p^4 distinctly larger, posterior basal ledges of p^3 , p^4 , p_3 , p_4 , and m_1 somewhat heavier and more sharply marked off from teeth, cingulum of canines broader. Length of fur as in *Pt. pelewensis*, shorter than in *Pt. admirabilitum*. Blackish above and beneath, sprinkled with whitish; mantle and sides of neck strongly contrasting yellowish buff; foreneck washed with russet. Forearm about 130 mm.

Type. ♂ ad. skin and skull, Yap Island, W. Carolines; collected by Capt. Peters (Godeffroy Museum); B.M. 74. 10. 5. 11.

Specimens examined. Two, in the British Museum.

Range. Western Caroline Islands: Yap and Mackenzie Islands.

Pteropus cognatus, sp. n.

Allied to *Pt. brunneus* (E. Queensland). General size of skull as in that species, but rostrum much shorter, from front of orbit to tip of nasals 17 mm., against 21 in *Pt. brunneus*; mandible markedly heavier posteriorly, coronoid height 26 mm. (rather greater than lower tooth-row, $c-m_3$), against 23.7 (less than lower tooth-row) in *Pt. brunneus*. m_1 considerably reduced, little more than half the size of p_1 ; also m^2 somewhat smaller than in *Pt. brunneus*. Colour essentially as in the allied species. Forearm approximately 121 mm.

Type. ♂ imm. skin and skull, San Christoval, S.E. Solomon Islands; collected by J. Macgillivray; presented by the Museum of Economic Geology; B.M. 55. 11. 7. 9.

Specimens examined. One adult skull, two immature skins and skulls, in the collection of the British Museum.

Range. San Christoval, S.E. Solomon Islands.

Pteropus rubianus, sp. n.

Allied to *Pt. rayneri*, but much larger. Back Vandyck-brown, rump sharply contrasting yellowish buff, mantle and foreneck dark russet, shading to deep tawny on sides of breast and belly, and to yellowish buff on crissum; centre of breast seal-brown; forehead and sides of face mottled yellowish buff and chestnut. Forearm 163 mm.

Type. ♂ ad. alc. and skull, Rubiana, Central Solomon Islands; collected by C. M. Woodford, Esq.; B.M. 88. 1. 5. 1.—The type is the only specimen examined.

Pteropus lavellanus, sp. n.

Allied to *Pt. rubianus*, but cingulum of upper and lower canines broader, general size of animal smaller, tibia relatively much shorter (65·5–67·5 mm., against 76·5 in *Pt. rubianus*), colour of fur darker. Back glossy seal-brown; rump varying from cinnamon-rufous, through cinnamon, to nearly orange ochraceous buffy, in any case strongly contrasting with dark back; occiput, mantle, and foreneck chocolate; centre of breast and upper belly glossy blackish, forming a large oval patch; sides of breast and belly, including flanks, dark Mars-brown; circumocular space and sides of face mixed dark brown, buffy, and pale greyish. Forearm 151–156 mm.

Type. ♂ ad. skin and skull, Vella Lavella, Central Solomon Islands, 12th March, 1908; collected by A. S. Meek.

Specimens examined. Three, in the collection of the British Museum.

Range. Known from the type locality only.

Remarks.—The differential characters given above are based on a comparison with *Pt. rubianus*. From *Pt. grandis* (Shortland Island and Bougainville), which it closely resembles in the colour of the neck, back, rump, and underparts, *Pt. lavellanus* is readily distinguished by its smaller size (forearm of *Pt. grandis* 167–172 mm.), relatively shorter tibia (in *Pt. grandis* 76·5 mm.) and smaller ears, and by having the crown and face grizzled buffy, greyish, and dark brown, not uniform blackish or seal-brown as in *Pt. grandis*.

Pteropus solitarius, sp. n.

Allied to *Pt. lombocensis*, but smaller and paler in colour. Back Prout's brown, much lightened with buffy or buffy clay tips to the hairs; rump more unmixed buffy clay; breast, belly, and flanks much lighter than back, buffy tinged with golden clay; mantle between ochraceous buff and buff; fore-neck golden ochraceous buff, distinctly brighter than breast; occiput, crown, forehead, sides of face, chin, and throat nearly similar to mantle, though slightly darker, more tinged with tawny. Forearm 108·5 mm.

Type. ♂ ad. skin and skull, Alor Island (Ombay), Lesser Sunda Islands, 15th April, 1897; collected by A. Everett; B.M. 98. 11. 3. 16.—The type is the only specimen examined.

Pteropus rufus princeps, subsp. n.

Similar to *Pt. rufus rufus* (*Pt. edwardsi* auct.), but skull and external dimensions conspicuously larger. Total length of skull 77 mm. (69–73·8 in the typical form of the species); mandible 62 (54·5–58·2); forearm 170·5 (158·5–165·5).

Type. ♂ ad. alc. and skull, Fort Dauphin, S.E. Madagascar; collected by M. Cloisel; B.M. 91. 11. 30. 10.

Remarks.—The typical smaller form of the species is apparently confined to the northern and central part of Madagascar.

Pteropus lylei, sp. n.

Similar to *Pt. giganteus*, but in every respect much smaller; breast and belly usually blackish or seal-brown (as in *Pt. vampyrus*), but occasionally light-coloured (as in *Pt. giganteus*). Total length of skull 61–66·5 mm., against 71–76 in *Pt. giganteus*. Forearm 148–154 mm., against 163·5–176·5 in *giganteus*.

Type. ♀ ad. skin and skull, Bangkok, Siam, 20th Aug. 1903; presented by Th. H. Lyle, Esq.; B.M. 4. 4. 7. 2.

Specimens examined. Nine, in the collection of the Berlin (Bangkok specimens) and British Museums (Pechabun, Bangkok, Saigon).

Range. Siam (Pechabun, Bangkok); Saigon.

Remarks.—This species probably replaces *Pt. giganteus* in Siam, Cambodja, and Cochin-China. The Bangkok specimens in the Berlin Museum were catalogued by Matschie ('Megachiroptera,' p. 26; skull figured, pl. iv. fig. 8; 1899) under the name *Pteropus (Spectrum) assamensis*; McClelland's *Pt. assamensis* is, however, the Himalayan race of *Pt. giganteus*, *Pt. g. leucocephalus*, Hodgson.

Pteropus intermedius, sp. n.

Allied to *Pt. giganteus*, but breast and belly seal-brown or blackish like back. Forearm about 180 mm.

Type. ♂ ad. skin and skull, Amherst, near Moulmein; collected by W. Davison; presented by A. O. Hume, Esq.; B.M. 85. 8. 1. 101.

Remarks.—In skull and dentition this species is scarcely distinguishable from *Pt. giganteus*; in all external characters, except the colour of the breast and belly, it is similar to that species, though apparently rather larger; but it resembles *Pt. vampyrus* in the blackish colour of the breast and belly. From the geographically nearest race of *Pt. vampyrus*, viz. *Pt. v. malaccensis* (see below), it is readily distinguished by its much smaller size (forearm about 180 mm., against 200–209) and by having the foreneck nearly as bright-coloured as the mantle, in strong contrast to blackish breast and belly. From the Siamese *Pt. lylei* (forearm 148–154 mm.) it differs by its much larger size.

Pteropus vampyrus malaccensis, subsp. n.

Mantle bright-coloured, sharply contrasting with dark back. Skull, total length 76·5–86·5 mm.; forearm 200–209 mm.

Type. ♂ ad. skin and skull, Kuala Tembeling, Pahang, Malay Peninsula, 26th Aug. 1903; collected by H. C. Robinson, Esq.; B.M. 6. 10. 4. 7.

Specimens examined. Nineteen, from the collections of the Leyden (three, Sumatra; one, Banka), U.S. National (three, Linga Arch.*), and British Museums.

Range. Malay Peninsula; Sumatra; Linga Archipelago; Banka.

Remarks.—The range of *Pt. vampyrus*, in its full specific sense, covers almost exactly the Indo-Malayan subregion as defined by Wallace; only in the extreme south-east the species crosses "Wallace's line" and extends to Timor. Within this vast area *Pt. vampyrus* is differentiated into six races. Three of these, viz. *Pt. v. platon* (Bali and Lombok), *Pt. v. edulis* (Savu and Timor), and *Pt. v. lanensis* (Philippines), are "melanistic" races, i. e. the mantle is generally blackish or Vandyck-brown, similar in colour to, or not strongly contrasting with, the back. In the three other races the mantle is generally some shade of buffy, much paler than, and strongly contrasting with, the back; of these,

* U.S. N. M. 101590–91, 101593.

Pt. v. natunæ (Natuna Islands and Borneo; see below) is characterized by its small size: forearm 182·5–196 mm.; *Pt. v. malaccensis* is considerably larger: forearm 200–209 mm.; *Pt. v. vampyrus* (Java) the largest: forearm 208–220 mm., and, together with *Pt. v. pluto* (Bali and Lombok), the largest bat known.

Pteropus vampyrus natunæ, subsp. n.

Similar to *Pt. vampyrus malaccensis*, but smaller. Skull, total length about 73–78 mm.; forearm 182·5–196 mm.

Type. ♂ ad. skin and skull, Pulo Panjang, North Natuna Islands, Sept. 1894; collected by E. Hose; presented by the Tring Museum; B.M. 95. 11. 8. 1.

Specimens examined. Twelve, in the collections of the Leyden, U.S. National*, and British Museums.

Range. North Natuna Islands (Bunguran; Pulo Panjang); N. Borneo (Sarawak).

Remarks.—See *Pt. vampyrus malaccensis* (above).

Pteropus morio, sp. n.

Allied to *Pt. alecto*, but much smaller and with much longer fur. Hair of back 16–17 mm., against 7–11 in *Pt. alecto*. Back seal-brown, slightly lightened by dark Vandyck-brown tips to most of the hairs and sprinkled with a few whitish hairs; rump conspicuously washed with pale Vandyck-brown, owing to brownish tips to hairs being longer and paler than on back; underparts essentially as in *Pt. alecto*; mantle deep chocolate with blackish bases to the hairs; sides of neck, foreneck, and head as in *Pt. alecto*. Forearm about 141 mm. (160–175 in *Pt. alecto*).

Type. ♀ ad. skin and skull, Waingapo, Sumba, Oct. 1896; collected by A. Everett; B.M. 98. 11. 3. 15.

Specimens examined. Four, in the collection of the British Museum.

Range. Sumba and Savu, Lesser Sunda Islands.

Pteropus pilosus, sp. n.

Allied to *Pt. pselaphon* (Bonin and Volcano Islands), but i_3 and p_1 larger, fur much shorter, forearm and tibia less thickly clothed, feet naked, colour much paler, external dimensions larger. i_3 more than three times (in *Pt. pselaphon* about twice and a half) the bulk of i_1 ; p_1 about twice the size of (in *Pt. pselaphon* subequal to) m_3 . Approximate length

* U.S. N. M. 104723–26; Bunguran.

of hair of back 20 mm. (30 mm. in *Pt. pseleaphon*). Back and rump chocolate, conspicuously sprinkled with long shining whitish-grey or buffy-grey hairs; breast, belly, and flanks paler than upperside, between Vandyck-brown and Marsbrown, thickly mixed with long, coarse, buffy hairs; mantle and occiput deep tawny, shading to chocolate tawny on sides of neck and to Vandyck-brown on foreneck; mantle slightly, sides of neck and foreneck more thickly sprinkled with coarse buffy hairs; centre of crown golden buffy; forehead, sides of crown, sides of head, chin, and throat dark Vandyck-brown, thickly mixed with buffy or greyish-white hairs. Forearm about 151·5 mm. (in *Pt. pseleaphon* 132·5-141, in the allied *Pt. tuberculatus* 119·5 mm.).

Type. ♂ ad. alc. and skull, Pelew Islands; Godeffroy Museum; B.M. 74. 10. 5. 3.—The type is the only specimen examined.

Pteropus dobsoni, nom. n.

Pteropus fuscus, Dobson, Cat. Chir. Brit. Mus. p. 59, pl. iv. fig. 5 (teeth) (June 1878).

The technical name given by Dobson to this species is preoccupied by *Pteropus fuscus*, E. Geoff., 1803 (Cat. Mamm. Mus. Nation. d'Hist. Nat. p. 46), which is *Pt. niger*, Kerr, 1792 (*Pt. vulgaris*, auct.); by *Pteropus fuscus*, Desmarest, 1803 (N. Dict. d'Hist. Nat. xix. p. 544), which is *Pt. subniger*, Kerr, 1792 (*Pt. rubricollis*, auct.); and by *Pteropus fuscus*, Blainville, 1840 (Ost. Mamm. i. Chiropt. p. 100, pl. vi. fig. 1), which is *Pt. vampyrus*, L., 1758.

XLIII.—*New Bats and Rodents in the British Museum Collection.* By OLDFIELD THOMAS.

Murina balstoni, sp. n.

Allied to *M. suilla*, Temm., of which the Museum possesses a pair from the Willis Mts., E. Java, but distinguished by the following characters:—(1) The general colour is browner, not rufous or fulvous, the hairs of the back slaty grey at base. (2) The hind limbs and interfemoral membrane are but very sparsely covered with hair, instead of being rather thickly clothed, the edge of the membrane with but few scattered hairs along it. (3) The under surface is uniformly white or creamy, the sides not or quite inconspicuously more greyish

than the centre; in *suilla* the sides are distinctly grey. (4) Cutaneous system dark throughout. (5) Skull smaller and more delicately built.

Dimensions of the type (the starred measurements taken in the flesh by the collector) :—

Forearm 31·5 mm.

*Head and body 44; *tail 30; *ear 14; third finger, metacarpal 28, first phalanx 12; lower leg and foot (c. u.) 21.

Skull: greatest length 14; basi-sinual length † 10·2; zygomatic breadth 8·3; interorbital breadth 4·3; brain-case breadth 7; front of canines to back of m^3 4·8.

Hab. Tasikmalaja, Preanger, Java.

Type. Adult female. Original number 1160. Collected 13 January, 1908, by G. C. Shortridge and presented by W. E. Balston, Esq.

Of the two closely allied Javan species of *Murina* in the Museum it is evident that it is that from the Willis Mts. which should be referred to *suilla*, as it has the hairy interfemoral, the reddish colour, and the grey-sided under surface described by Temminck as characteristic of his species.

Murina florium, sp. n.

Essential characters as in *M. suilla*, Temm., but greyer and with less hairy interfemoral.

Size slightly greater than in the allied species. General colour above hoary grey, without tinge of rufous or fulvous, the hairs pale grey tipped with brownish. Under surface dull whitish along the middle line, greyish brown laterally, the white median portion less extended than in *suilla*. Hind limbs and interfemoral membranes almost naked, not well clothed as in *suilla*.

Skull essentially like that of *M. suilla*, but rather larger.

Dimensions of the type (measured in skin) :—

Forearm 35 mm.

Tail (c.) 32; third finger, metacarpal 31, first phalanx 13·5; hind leg and foot (c. u.) 23.

Skull: front of canine to back of m^3 5·3.

Hab. Flores.

Type. B.M. no. 63.12.26.14. Collected by Dr. A. R. Wallace.

† In describing bats a name is frequently wanted for the measurement from the basion to the base of the anterior palatal notch. As the Latin for notch (*incisio*) makes a compound too like one based on the incisor teeth, I would suggest the above word, based on *sinus*, a bay or gulf, to which this deep rounded hollow has much resemblance.

This bat was referred to *M. suilla* by Dobson, but is readily distinguished from that species by its greyer colour and nearly naked interfemoral and hind limbs.

Chalinolobus gouldi venatoris, subsp. n.

Similar to the true *C. gouldi* of Tasmania in essential characters, but size smaller, fur shorter (hairs of back under 5 mm. in length, as compared with over 6), ears rather larger, and the colour darker, the posterior back less broadly washed with rufous. Skull smaller throughout, the brain-case noticeably lower.

Dimensions of the type (the starred measurements taken in the flesh by collector) :—

Forearm 40 mm.

*Head and body 54; *tail 42; lower leg and foot (c. u.) 25·5; *hind foot 8; *ear 11.

Skull: greatest length 14; basi-sinual length 10·9; brain-case, breadth 7·6, height from basion 5·8.

Hab. Alexandria, Northern Territory of S. Australia.

Type. Old female. B.M. no. 6. 3. 9. 4. Original number 125. Collected 25 May, 1905, by W. Stalker. Presented by Sir W. Ingram and the Hon. John Forrest. Six specimens examined.

This is the furthest north that *C. gouldi* has been found, and the general reduction in size seems to demand a special subspecific name. Examples from the southern part of the Australian mainland are intermediate between this and the typical Tasmanian *gouldi*.

Kerivoula agnella, sp. n.

Near *K. hardwickei*, but larger and with the brain-case broader posteriorly.

Structure of ears and tragus essentially as in *hardwickei*, the tip of the former and the small projecting point at the outer base of the latter rather less sharply defined. Fore-arms not absolutely naked. Hind legs and feet, tail and the whole of the interfemoral membrane well haired, a small fringe at the hinder edge of the interfemoral.

General colour above and below (in spirit) greyish brown, rather more fulvous on the hind legs, tail, and interfemoral.

Skull larger than that of *K. hardwickei*. Brain-case broader at its broadest part, and also less narrowing posteriorly, the mastoid width decidedly exceeding the greatest breadth of the brain-case, which equals it in *hardwickei*.

Teeth as in *K. hardwickei*, except that the outer incisor is about three-fourths the height of the inner one, and the canines appear to be thrown out more abruptly from the muzzle when viewed from above. Lower incisors trifid; overlapping.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 38 mm.

Head and body 44; tail 48; ear 13·5; tragus on inner edge 8; third finger, metacarpal 38·5, first phalanx 19; lower leg and foot (c. u.); calcar 26·5.

Skull: greatest length 14·7; basi-sinual length 10·8; breadth of brain-case 7·2; mastoid breadth 8; front of canine to back of m^3 6.

Hab. St. Aignan Island, S.E. of New Guinea.

Type. Adult female in spirit. B.M. no. 98. 4. 1. 2. Collected by A. Meek.

The examination of a number of the true *K. hardwickei* from Java recently presented to the National Museum by Mr. W. E. Balston has convinced me that this specimen should be separated specifically from that animal.

The specimen from Duke of York Island referred somewhat doubtfully to *K. hardwickei* by Dobson † also appears to belong to *K. agnella*, but has rather shorter outer incisors.

Nyctinomus leonis, sp. n.

Nyctinomus brachypterus, Peters, Dobson, P. Z. S. 1876, p. 722; Cat. Chir. B.M. p. 426 (1878) (nec Peters, Reis. Mossamb., Säug. p. 59, pl. xv. fig. I, 1852).

External characters as described by Dobson.

Skull of the high, not flattened *Nyctinomus* type, with well-marked median crest; emargination between premaxillæ very narrow, about 0·75 mm. in greatest breadth. Four lower incisors.

Measuréments of type:—

Forearm 37·5 mm. (For other external measures, see Dobson.)

Skull: greatest length 19·4; basal length 15·5; zygomatic breadth 12·1; intertemporal breadth 4; mastoid breadth 11·3; palatal length 8; front of canine to back of m^3 7.

Hab. West Africa. Type from Sierra Leone. Other specimens from Fernando Po (Capt. Downes), Cameroons (*C. Bovallius*), and French Congo (*G. L. Bates*).

Type. Adult male skin. B.M. no. 62. 12. 23. 3. Specimen c of Dobson's catalogue. Presented by J. Brown, Esq.

† Cat. Chir. B.M. p. 386 (1878).

This species, referred to *N. brachypterus* by Dobson, is evidently not that described by Peters, for the skull of the latter is no less than 21·5 mm. in length, while the typical skull of *N. leonis*, 19·4 mm. long, is the largest of the five skulls of the western form examined by me.

On the other hand, Dr. Jentink's *N. bennemeleni* from Liberia has, as he has been so good as to inform me, a skull only 16·5 mm. in total length, with a tooth-row length of just 6·0 mm.

Dipodillus campestris roszkæ, subsp. n.

Similar in essential characters to the true *D. campestris* of Algeria; north of the Atlas, but the colour much paler.

Size, proportions, and degree of tail-tuft as in *campestris*.

General colour pale fawn, darkest on the back, clearer on the sides, where there is scarcely a trace of the buffy tone found in *campestris*. Under surface, hands, and feet pure white. Tail whitish or pale fawn above, white below, the tuft, which is of medium development, pale slaty greyish.

Skull with rather smaller bullæ than in true *campestris*.

Dimensions of the type (measured in the flesh) :—

Head and body 102 mm.; tail 120; hind foot 2·5; ear 15.

Skull: greatest length 80; greatest breadth 15·5; nasal length 11·3; breadth of brain-case 13·6; upper molar series 3·9.

Hab. Biskra, Algeria.

Type. Adult male. B.M. no. 8. 7. 12. 16. Original number 35. Collected 1 April, 1908, by J. Steinbach, and presented by the Hon. N. C. Rothschild. Two specimens.

D. campestris was not hitherto known to occur south of the Atlas, and I had supposed it to be represented by the larger and more tufted-tailed *D. dodsoni*. But these specimens are clearly much more closely allied to it than is the latter, and do not seem to be more than subspecifically separable.

In company with this gerbil, Mr. Rothschild has presented to the Museum a number of other species from Biskra, of which the most interesting are *Elephantulus deserti*, *Dipodillus garamantis*, *Meriones schousboei*, and *Psammomys algiricus*.

Mus woodwardi, sp. n.

Closely allied to the *M. tunneyi*, Thos., of Mary River, Northern Territory, but smaller throughout. Colour quite as in that species, the upperside of the same yellowish buffy, and the underside similarly white. Indeed the two animals

cannot be distinguished externally except by the much shorter hind feet of *M. woodwardi*.

Skull much smaller than that of *M. tunneyi* in all dimensions, though of the same general shape. Supraorbital ridges less developed. Anteorbital plate less projected forwards. Palatal foramina less open. Bullæ smaller. Molars similar in structure, but both narrower and shorter.

Dimensions of the type :—

Head and body not measured by collector, and evidently stretched; tail 114 mm.; hind foot 25·5; ear 17.

Skull: back of interparietal to tip of nasals 31·5; zygomatic breadth 18; nasals 11·5 \times 3·3; interorbital breadth 5; greatest divergence of parietal ridges 12; palatilar length 15·7; diastema 9; palatal foramina 6·8; greatest diameter of bullæ 8·8; length of upper molar series 6; breadth of m¹ 2·2.

Hab. Legrange Bay, N.W. Australia.

Type. Old female. B.M. no. 5.1.9.1. Collected January 1899 by J. T. Tunney, and presented by the Perth Museum through Mr. B. H. Woodward, after whom the species is named. Two specimens examined.

Closely related as it is to *M. tunneyi* in all essential characters, *M. woodwardi* is readily distinguishable by its much shorter feet and smaller skull and teeth.

XLIV.—*A new Fruit-Bat from Sierra Leone.*

By OLDFIELD THOMAS.

THE British Museum owes to Canon F. C. Smith the skin of a Rouset from Sierra Leone clearly differing from any species hitherto described. It may be called

Rousettus smithii, sp. n.

Most nearly allied to *R. angolensis*, with which it forms a distinct section of the genus, but differing in the following characters :—Size much smaller, the skull also narrower and with less widely expanded zygomata. Fur shorter and more resembling that of ordinary Rousets (that of *R. angolensis* being unusually long and silky), and not extending so far down the hind limbs, the proximal half only of the tibiae being clothed. Ears narrower. Colour dull brown without rufous suffusion; neck more greyish.

Skull more lightly built than in *R. angolensis*, but agreeing with it in all essential respects, such as the very slight deflection of the brain-case, the co-ossification of the premaxillæ, and the swollen supraorbital margins. Teeth of the same squarish form, but smaller throughout, and similar in relative proportions, with the exception that the last molar, both above and below, is very much smaller, about one-third instead of one-half the size of the tooth immediately preceding it.

Dimensions of the type (not fully adult) :—

Forearm 70 mm.

Head and body (c.) 112; tail 11; pollex (c. u.) 28·5; third finger, metacarpal 49·5, first phalanx 32·5, second phalanx 41; lower leg and hind foot (c. u.) 46.

Skull: greatest length 38·5; zygomatic breadth 20·5; supraorbital foramina to tip of nasals 18; breadth of brain-case 15; front of canine to back of m^3 14·8; p^4 2·3 \times 1·8; m^3 1·4 \times 1·2; p_4 2·7 \times 1·7; m_3 1·3 \times 1·1.

Hab. Sierra Leone.

Type. Nearly adult female. B.M. 8. 9. 11. 1. Collected and presented by Canon F. C. Smith.

The many important characters by which *Rousettus angolensis* differs from all other members of the genus have recently been brought out in Dr. K. Andersen's admirable notes on the group *, so that no comparison of *R. smithii* with other species is required. From *R. angolensis* it is at once distinguishable by its smaller size (allowing, of course, for the slight immaturity of the type), smaller teeth, and, especially, by its much smaller posterior molars.

I have much pleasure in naming this Rouset after its discoverer, to whom the National Museum is indebted for various acceptable specimens.

XLV.—On the Dentition of the Diastema in some Fossil Reptiles referred to the Gomphodontia, from the Upper Karroo Rocks of Cape Colony. By H. G. SEELEY, F.R.S., F.G.S., King's College, London.

ONE of the notable features in the dentition of the fossil Reptilia which most closely resemble mammals is the toothless interval in the jaws between the canine and molar teeth. A similar toothless interspace is present in existing mammals,

* Ann. & Mag. Nat. Hist. (7) xix. pp. 501 et seqq. (1907).

so various as certain marsupials, chevrotains, horse, rhinoceros, pigs, rodents, so that no special importance can be claimed for the diastema in morphology or classification. Among some Mammalia there is evidence that the diastema is a consequence of shedding of deciduous teeth, as well as of the atrophy and suppression of teeth. There is reason for supposing that these fossil reptiles had a normal dental succession, in which a first or milk-series of teeth was followed by a permanent series; but there is no reason to believe that the reptilian teeth were pushed out and shed in quite the mammalian manner. The process of absorption of old teeth was carried much further in reptiles, and though no evidence has been seen of successional molar teeth among Theriodonts, the canines constantly have upon the roots unabsorbed portions of the teeth which preceded them, situate anteriorly in the mandible and posteriorly in the skull. This mode of succession may account for the occasional duplication of canine teeth, such as is found in *Cynognathus leptorhinus*, the one tooth being a milk-tooth, and the other permanent. There being no evidence of pushing out of the first set of teeth, which correspond to milk-teeth which are not replaced in mammals by permanent teeth, it follows that they can only disappear by a condition of weakness, feebleness as distinct from disease, which ensures inability to persist so well as the permanent molar teeth. The reptilian diastema therefore appears to be the portion of the alveolar border from which the crowns of teeth of the "milk-series" have crumbled away in the mature animal. Even with this suggested explanation there remains a short interval in the jaw without teeth behind the canine tooth which has to be accounted for. The teeth of the molar series in these fossil reptiles as they extend forward gradually diminish in size, exhibiting a species of atrophy; and it may be that nutrition fails as work diminishes, and teeth are never developed. Hence the reptilian diastema includes two elements—an anterior part, which originates in the mammalian way; and a posterior part, which illustrates the reptilian type of a false diastema, which may be regarded as a condition antecedent to the type which becomes developed as a true diastema in mammals.

In 1895, after discussing reptilian characteristics of the skull of *Tritylodon longaeus* (Owen), I gave a figure (Phil. Trans. Royal Society, 1895 B, p. 1028, fig. 4) of the anterior extremity of the right ramus of the mandible of a Theriodont reptile as illustrating the kind of mandible which that genus might possess, and as indicating the possibility that the

reputed incisors of *Tritylodon* are canine teeth, the incisors being lost earlier than the middle incisors of *Gomphognathus polyphagus*. Professor H. F. Osborn states, in the 'American Naturalist' for May 1898, that I figured a portion of the lower jaw of *Tritylodon*; but no generic determination was made of that fossil.

The specimen belongs to a larger animal than *Tritylodon longaeus*. The intractable matrix which obscured the alveolar border in the mandible has now been removed, and the jaw is referable to a species or subgenus of *Gomphognathus* near to *G. polyphagus*.

This mandibular fragment is $2\frac{1}{2}$ inches long from the incisor teeth to the first molar tooth. It is separated from the missing left ramus by fracture, but the rami were united by close bony union, and the socket of the first incisor of the left ramus remains with this specimen. The crown of that tooth may have perished during the life of the animal, though the larger part of the root remains, shown in a vertical fracture. The symphyseal surface, about $1\frac{1}{2}$ inch long, 1 inch deep in front, and $\frac{1}{4}$ inch deep posteriorly, was of long ovate form.

The inferior external surface of the jaw is convex from front to back, and from side to side slightly convex in front but somewhat flattened. This convex chin surface makes an angle with the relatively vertical external lateral surface, which is gently convex from above downward. The lateral surface is $\frac{1}{2}$ inch deep at the canine tooth and increases in depth as it extends backward. The internal surface of the jaw above the symphysis is a channel, nearly straight from front to back, sunk well below the level of the canine and the anterior half of the diastema.

The three incisor teeth are close-set. They occupy a width of half an inch. The crowns are broken, but they are nearly uniform in size, nearly circular, with a slight transverse natural compression. The third incisor is in front of the canine. The second and first incisor teeth are further forward successively, so as to make a curved external contour, much in the manner of *Gomphognathus kannemeyeri*, which is the only species with the mandible separated from the skull.

The canine tooth is directed upward and forward, and not outward as in *G. kannemeyeri*, so that there is no appreciable lateral bulbous expansion of the extremity of the mandible as in that species. The tooth is strong, laterally compressed, ovate in transverse section on the broken surface, $\frac{1}{8}$ inch from front to back at the fracture, and $\frac{1}{4}$ inch wide, but slightly wider anteriorly. What remains of the external

enamel, badly preserved, appears to be wrinkled. Below the middle of the canine tooth a shallow groove descends the external lateral surface of the dentary bone.

Behind the socket for the canine tooth a concave diastema measuring $1\frac{7}{16}$ inch intervenes between that tooth and the first tooth of the molar series. The crown of that molar stands fully $\frac{1}{2}$ inch above the alveolar margin. It is subquadrate, somewhat broken, less than $\frac{1}{4}$ inch in diameter, with external and internal ridge-margins in front. It is worn down transversely by apposition with a maxillary tooth to make a flat grinding surface. The posterior fracture terminating the fragment of the ramus, passes vertically through the vacant socket for the second molar tooth, which is about $\frac{9}{16}$ inch deep in the jaw and tapers as it descends.

The diastema is the most interesting region of the jaw, on account of its length, for in *Gomphognathus kannemeyeri* the concave interspace in the jaw between the mandibular canine and molars measures less than $1\frac{1}{2}$ inch, which is less than one-fourth as long as in this specimen. In *Gomphognathus polyphagus*, in which the jaws are closed, the mandibular diastema measures $1\frac{3}{16}$ inch.

The region of the diastema is compressed from the outer to the inner side, so as to make a blunt alveolar ridge situate towards the flattened inner side of the ramus, wider behind than in front. This ridge helps to define the convexity of the external surface of the dentary bone.

On carefully cleaning the summit-line it became evident that the ridge of the diastema carries teeth. Their crowns are level with the alveolar ridge or imperceptibly raised, and give no indication of having been more elevated. They have the aspect of flattened ovate denticles each with a central depression, occupied with black matrix, situated in advance of the molar teeth. They therefore appear to correspond in position with the milk-teeth of mammals, in which the teeth are shed and not replaced, but differ in being persistent in the jaw and in their simple condition and small size.

The teeth which are most evident are three in number, raised above the bone by the thickness of a stout paper, and defined at the base by a black line of matrix. It was necessary to determine whether they were superficial ossifications. I reluctantly sacrificed a part of the hindermost denticle, but under the steel point the whole crown became dissipated, displaying black matrix in the centre and an osseous rim. On scraping away the matrix no doubt is left that the root of the tooth is still in its socket, margined externally by dense white tissue, continuous with a minute fragment of the

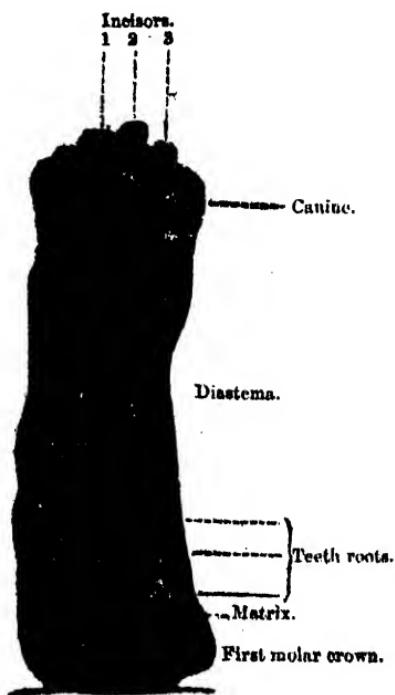
original crown. The area of the pulp-cavity is occupied with soft substance of the bluish-grey colour of the matrix, which may possibly show a radial structure. The teeth thus demonstrated increase in size posteriorly, where the diameter is about $\frac{3}{7}$ inch. There may possibly have been as many as four, but it is difficult to distinguish more than three, because they are level with the surface of the jawbone. The inference seems legitimate that these teeth originally possessed sharp elevated conical crowns, however unexpected it may be that all the crowns should disappear during life so as to extend the length of the diastema, leaving only polished dental surfaces of the same height as the alveolar ridge, which holds their roots.

In *Gomphognathus kannemeyeri* the condition is so dissimilar as to suggest a generic difference, for behind the short mandibular diastema of $\frac{1}{10}$ inch the teeth are all of the same stout type and contribute to form the grinding molar surface, though only the middle part of the mandibular armature is worn. They are similar to each other and not of a kind to be easily broken, and are packed in the closest possible succession. I have distinguished the first four as premolars and the remaining nine as molars, but there is no marked difference. There are only nine functional maxillary molars in *Gomphognathus* and allied genera, so that the thirteen teeth in the mandible of *G. kannemeyeri* must either indicate that the series is extended forward by teeth which are homologous with the small decollated teeth now described, or that *G. kannemeyeri*, the type of the genus, must be separated from the other species. The former alternative is preferable, in the absence of further evidence, but it requires that the premolars of the young *G. kannemeyeri* should be classed in the same category with the teeth in the diastema which are lost in this specimen. They are probably a part of the first series of teeth without masticatory function.

The maxillary dentition is only known in *Gomphognathus polyphagus*. In the original description (Phil. Trans. Roy. Soc. B, 1895, p. 18) the maxillary diastema is described as raised a little above the palate and prolonged backward by the curve of [six] small premolar teeth contained in a length of half an inch. It is remarked that the first on the left side appears to be worn down with use, but all the other teeth on a level with the maxillary bones are broken or lost. It is not possible now to determine whether the breakage took place during life or during the removal of the matrix, as seems probable. Their surfaces are certainly fractured by the chisel, and in that respect are unlike the larger teeth in the

mandible, described in this notice. In any case, it may be inferred that the crowns of the teeth, indicated by the circular outlines of their roots, were slender, sharp, and conical, in striking contrast with the masticating molars behind, and equally in contrast with the corresponding teeth of *G. kannemeyeri*.

A more instructive dental condition is seen in the skull, probably of the same species of *Gomphognathus*, which I found at Lady Frere, indicated as R. 2578 in the British Museum.



Right ramus of mandible of *Gomphognathus (Diastemodon) dimorphodon*, seen from above, showing extent of symphysis and roots of teeth in the diastema.

In the middle of the maxillary diastema on the left side, behind the canine tooth is one crown quite perfect, small, strong, sharply pointed, recurved, which may be an early premolar. It is the type of cutting prehensile crown which may have existed in the specimen of *G. polyphagus* from the same locality, numbered in the Brit. Mus. 2576-7, and may have been present in the allied species indicated by this fragment of the right mandible. The bases of these teeth are

badly exposed in all the specimens. This species, defined by larger size, longer diastema, larger ovate roots of the decollated teeth, and relatively less depth of the jaw, is provisionally indicated as *Gomphognathus (Diastemodon) dimorphodon*. The differences from *Gomphognathus kannemeyeri* in the types of premolar teeth conveniently separate *G. polyphagus* and this species as the subgenus *Diastemodon*.

The figure is of the natural size and shows the aspect from above. The specimen is in the South-African Museum, Cape Town. I am indebted to the Trustees for the opportunity of making this further examination of the fossil.

XLVI.—*Notes on the Forficularia.—XIV. A Revision of the Pygidicraninæ.* By MALCOLM BURR, B.A., F.E.S., F.L.S., F.Z.S., &c.

MOST of the species referred to in the following notes have been hitherto included in the capacious genus *Pygidicrana*, Serville. An examination of the material in my own collection, with a view to revising the somewhat arbitrary arrangement of de Bormans, has induced me to establish some new genera, based chiefly on characters which have not hitherto been employed in this genus.

The group-name was invented by Verhooff, who divided it into *Pygidicraninæ* for the type genus and *Pyragrinæ* for *Pyragra*, *Echinosoma*, and perhaps *Echinopsalis*. These last genera are not discussed in these pages. They represent the transition towards *Labidura*. The femora are neither compressed nor keeled, the elytra are stronger at the axillary angle, and consequently the scutellum is only present as an exception in *Pyragra* and never in the other genera, in which the pronotum extends well over the insertion of the elytra. *Pyragra* is in many respects undoubtedly allied to *Pygidicrana*, but *Echinosoma* shows the transition through *Echinopsalis* to *Psalis*, *Labidura*, and *Anisolabis*.

In the *Pyragrinæ* the pronotum is always transverse, in the *Pygidicraninæ* never.

An important generic character, which will be of undoubted use in the future, is the form of the sternal plates*, especially of the lobe of the metasternum.

* The value of these shields as a generic character was appreciated by Scudder in 1876, though he failed to make very much use of them.

The posterior margin of the metasternal lobe is always sinuate or excavate in the Pygidicraninæ. It is invariably truncate in the Pyragrinæ, a very Labidurine feature.

The two curious genera *Anataelia* from the Canary Islands and *Challia* from Korea resemble the Pygidieranæ in their general form and appearance, even to the compressed and carinate femora, but the lobe of the metasternal plate is straight, and the first seven or eight antennal segments do not agree. For the present they may be regarded as aberrant forms which may be most conveniently placed as a sort of appendix to the Pygidieranæ.

The chief characteristics of the group are as follows:—

Antennæ with over 30 segments; 3 not much longer than 2; 4-7 short, not longer than 2, as broad as long, the remainder lengthening out to long and cylindrical.

Elytra quite flat on the dorsal surface, strongly folded, but usually with no keel; lateral surface hollowed; axillary angle of elytra weak, exposing a triangular scutellum of varying size. The pronotum is oval or rectangular, but longer than broad, it scarcely extends over the elytra.

The prosternum is narrowed behind the middle, then dilated on each side at the extreme base. Mesosternum subquadrate, the angles rounded and posterior margin truncate or rounded. Metasternum with lobe transverse, posterior margin sinuate or excavate.

Femora stout, compressed, and furnished with several carinulae; tibiæ compressed; tarsi of various forms.

Table of Genera.

1. *Corpus omnino apterum* (*tarsi graciles*):
genus *africanum* 1. *Dacnodes*, Burr.
- 1.1. Elytra et alæ perfecte explicate vel abbreviatae.
2. Tarsorum segmenta 1 et 2 depresso, brevia,
valde dilatata 2. *Tagalina*, Dohrn.
- 2.2. Tarsorum segmenta 1 et 2 cylindrica,
brevia vel longa (*sepius primo cylindrico, elongato*).
3. Elytra amplia; scutello parvo, angusto.
4. Pronotum orbiculare (segmentum
penultimum ventrale ♂ amplum). 3. *Pygidicrana*, Serv.

They were neglected by later authors till Verhoeff employed the narrowing of the prosternum to characterize the Gonolabidæ, but the value of his work in this respect may be estimated when it is understood that he omitted to examine all available Gonolabidæ, with the result that his characterization of the family excludes the type of the genus *Gonolabis*!

4.4. Pronotum rectangulare.
 5. Segmentum penultimum ventrale
 ♂ latum, amplum 4. *Dicrana*, g. n.
 5.5. Segmentum penultimum ventrale
 ♂ angustum.
 6. Caput pronoto haud angustius.. 5. *Cranopygia*, g. n.
 6.6. Caput pronoto angustius vel
 sequē latum..... 6. *Pierania*, g. n.
 3.3. Elytra brevia; scutellum ampliū,
 transversum, pronotum latitudine
 sequans 7. *Pyge*, g. n.

Genus I. DACNODES, Burr.

There is nothing to add to the remarks on this genus in an earlier paper in Ent. Month. Mag. (2) xviii. p. 60 (1907).

Genus II. TAGALINA, Dohrn.

This genus seems to be rare; it is well characterized by the remarkable form of the tarsi. The two species are probably mere colour-varieties; one was redescribed and figured by me in 1902 (*Termes. Füz.* xxv. p. 477, pl. xx. fig. 1, ♂).

Genus III. PYGIDICRANA, Serv.

This genus is now restricted to the forms which approach the *P. marmoricrura*, Serv. It is confined to the species in which the scutellum is small, the organs of flight well developed, the pronotum oval and nearly round, and the penultimate ventral segment of the male broad and rounded.

Even in this restricted sense it retains the majority of the species and is represented in all tropical regions of the world.

The type is *P. v-nigrum*, Serv.

Table of Species.

1. Segmentum penultimum ventrale ♂ marginē postice medio rotundato-emarginato (caput nigrum; elytra fusco-testaceo):
 species africana 1. *biafra*, Borm.
- 1.1. Segmentum penultimum ventrale ♂ marginē postico leviter sinuato, vel rotundato, vel apice ipso depresso-canaliculato.
2. Segmentum penultimum ventrale ♂ marginē postico medio apice ipso canaliculo depresso instructum (colore fusco maculis varii lineisque fulvis ornato):
 species asiatica 2. *picta*, Guér.

2.2. Segmentum penultimum ventrale ♂
margine postico integro.
3. Segmentum penultimum ventrale ♂
margine postico leviter sinuato;
tarsi breves, segmento primo quam
tertium breviori: species americana. 3. *siebrigi*, sp. n.

3.3. Segmentum penultimum ventrale ♂
late rotundatum; tarsi longi, gra-
ciles, segmento primo tertium
sequanti vel superanti.

4. Forcipis bracchia ♂ contigua, haud
arcuata.

5. Forcipis bracchia ♂ æqualiter
curvata: species australica....

5.5. Forcipis bracchia ♂ inæqualiter
curvata.

6. Forceps ♂ supra dente basali
armatus, bracchio sinistro
haud angulato

6.6. Forceps ♂ supra inermis,
bracchio sinistro medio angu-
lato

4.4. Forcipis bracchia ♂ arcuata, scipius
aream ovalem includentia.

5. Forcipis bracchia ♂ haud elongata,
fortiter curvata, ante apicem
marginis interno dilatata.

6. Pronotum V-nigro-signatum;
elytra nigro-vittata: species
americana.....

6.6. Pronotum et elytra fulva:
species asiatica

5.5. Forcipis bracchia ♂ elongata,
haud dilatata, ante apicem
dentata.

6. Elytra unicoloria.

7. Pronotum bivittatum: species
americana:

7.7. Pronotum castaneum: species
celebensis

6.6. Elytra vittata vel maculata:
species asiaticæ.

7. Statura maxima; pronoti
vittæ postice confluentes .

7.7. Statura mediocre; pronoti
vittæ irregulares vel pa-
rallelæ.

8. Statura majore (82-85
mm.); caput nigrum
macula irregulari occipi-
tali ornatum.....

8.8. Statura minore (20-21
mm.); caput fulvum,
nigro-circumdate.... 18. *siamensis*, Dohrn.

3. *dæmeli*, Dohrn.

5. *imperatrix*, Burr.

6. *valida*, Dohrn.

7. *v-nigrum*, Serv.

8. *pallidipennis*, Haan.

9. *forcipata*, Kirby.

10. *celebensis*, Borm.

11. *eximia*, Dohrn

12. *marmoricrura*, Serv.

Pygidicrana fiebrigi, sp. n.

Statura majore; caput nigrum; pronotum fulvum, vittis 2 fuscis
haud parallelis ornatum; elytra brevia, nigra, anguste pallido-
marginata; aliae breves, fulvae; pedes fulvi, femoribus marmo-
ratis, forcipis brachia ♂ basi depresso-triquetra, valida, in parte
basali divergentia et attenuata; dehinc fortius arcuata, ante
apicem margine interno incrassata et macronata.

Long. corporis	24 mm.	^{♂.}
" forcipis	5·5 "	

Large and powerful.

Antennæ black, with 30 segments, typical.

Head black.

Pronotum convex anteriorly, broadest at the shoulders,
narrowed posteriorly.

Posterior margin truncate; about as broad as the head
anteriorly; fulvous, with two broad black bands, which are
divergent in the prozona and convergent posteriorly.

Scutellum triangular, fulvous.

Elytra rather short, black, with a very narrow yellow line
along the lateral margins.

Wings short, yellow.

Feet yellowish, the femora marbled with fuscous; tarsi
short and broad, the first segment shorter than the third.

Abdomen dilated posteriorly; last dorsal segment ample,
smooth, with tawny pubescence and median suture; posterior
margin truncate; penultimate ventral segment ample, broadly
rounded, slightly emarginate in middle of posterior margin,
exposing last segment at the corners.

Forceps ♂ with the branches subcontiguous at the base
itself, depressed, triquetre, and stout, strongly diverging in
basal half, then attenuate, and strongly bowed inwards; just
before the apex incrassate, to form a depressed triangular
projection, then straight and hooked at the apex.

Paraguay: San Bernardino (*C. Fiebrig*, S. V.) (cm. et
Mus. Berol.; Jr. no. 1249/06).

Type in my collection.

Differs from *P. v-nigrum*, *P. forcipata*, *P. notigera*, and
P. egregia in the black elytra; from *P. bivittata* in the angled
bands on the pronotum; the forceps are of the same type as
those of *P. v-nigrum* and *P. bivittata*, but differ in details.

Genus IV. DICRANA, nov.

A genero *Pygidicrana* differt pronoto subrectangulari, scopio subquadrato; a genero *Cranopygia* differt segmento penultimo ventrali ampio, lato, rotundato.

Type, *Pygidicrana frontalis*, Kirby.

The rectangular pronotum readily separates the genus from *Pygidicrana*, but it only differs from *Cranopygia* in the broad, rounded, penultimate ventral segment.

The African species form a natural group with a very distinctive coloration. I have not examined an undoubted *P. caffra*, but it appears to resemble *P. bettoni* and its allies so closely that I do not hesitate to range it here.

P. kallipyga has marked affinities with *Cranopygia* in the form of the last dorsal segment and the forceps, but the penultimate ventral segment of the male is so broad and decidedly rounded that it is not possible to place it there; this is unfortunate, as its position near *D. finschi* appears hardly natural.

Table of Species.

1. Segmentum penultimum ventrale ♂ lateribus rectis, angulis rotundatis, margine postico leviter sinuato: species africanae.	
2. Forcipis brachia ♂ brevia, lata, fortiter arcuata.	1. <i>bettoni</i> , Kirb.
3. Forcipis brachia ♂ ante apicem dilatata, laminam rectangularem efficiens	2. <i>caffra</i> , Dohrn.
3.3. Forcipis brachia ♂ ante apicem dente forti armata	3. <i>frontalis</i> , Kirb.
2.2. Forcipis brachia ♂ leviter arcuata.	4. <i>separata</i> , sp. n.
3. Elytra vittis angustis 2 rufescens ornata	
3.3. Elytra macula pallida ornata	
1.1. Segmentum penultimum ventrale ♂ totum rotundatum.	5. <i>kallipyga</i> , Dohrn.
2. Statura majore; capite rufo; segmentum ultimum dorsale ♂ angulis valde plicatis.	
2.2. Statura minore; capite nigro, flavo-notato: segmentum ultimum dorsale ♂ inerme.	6. <i>Korgfeldi</i> , Kirby
3. Pronotum nigrum, albo-limbatum; elytra fusca, unicoloria	
3.3. Pronotum nigrum, flavo-marmoratum; elytra nigra, flavo-maculata	7. <i>finschi</i> , Karsch.

Dicrana separata, sp. n.

Statura media; testacea, nigro-variegata; pronotum parallelum

scutellum parvum; elytra ampla; alæ longæ; segmentum ultimum dorsale ♂ amplum quadratum; segmentum penultimum ventrale ♂ amplum, latum, margine postico medio leviter exciso, angulis late rotundatis; forcipis bracchia ♂ basi remota, depressa, elongata, sensim arcuata, ante apicem dente interno forti armata. ♂.

Long. corporis	20	mm.	♂.
" forcipis	4·5	"	

Antennæ testaceous.

Head testaceous, with a black spot on the frons and a narrow black border round the occiput.

Pronotum parallel, longer than broad, subrectangular.

Angles rounded, testaceous, with two broad black bands.

Scutellum small, testaceous.

Elytra black, with a reddish-yellow discoidal spot in the anterior portion.

Wings yellow, faintly shaded with fuscous.

Feet testaceous, the femora indistinctly marked with fuscous; tarsi slender, first segment longer than third.

Abdomen blackish, with a fine dense pubescence.

Last dorsal segment ♂ ample, square, smooth, simple.

Penultimate ventral segment ♂ ample, broad, angles broadly rounded, posterior margin with a small median emargination.

Forces ♂ with the branches depressed; at the base itself they are dilated, so as to be almost contiguous, but this portion is exceedingly short, and the branches appear to be remote at the base; they are rather slender, gently arcuate, and armed with a strong tooth near the apex on the inner margin.

German East Africa: Hinterland, ? Nguru (*Rohrberk*).

1 ♂.

This form is barely distinguishable from *P. frontalis*, Kirby, from the Cameroons; in that species the short apical portion of the forceps beyond the tooth is straight, in *P. separata* it is arcuate; in the latter the last dorsal segment is smooth (granulose in *P. frontalis*); the elytra of *P. frontalis* have two narrow reddish bands instead of a large oval spot.

In the form taken by Sjöstedt at Kilimandjaro (Burr, in Sjöstedt's 'Exped. Kilimandjaro,' 17. Orthopteren, 1. Dermaptera, p. 3, pl. i. fig. 1, ♂, 1907) (Sjöstedt's specimen), the elytra have the whole anterior portion pale, and the last dorsal segment is not so smooth. At first I regarded

it as identical with *P. bettoni*, Kirby; since then I have been able to examine Kirby's types and Karsch's types of *P. caffra* in the Berlin Museum. There is an astonishing resemblance in colour and markings between these African species, *P. caffra*, *P. bettoni*, *P. frontalis*, *P. separata*; apart from the forceps they are practically indistinguishable, and the forceps differ in degree rather than in kind. Perhaps when a large amount of material can be examined together, it will be possible to arrange a series passing through all these forms from one extreme to another. For the present, however, it is convenient to give distinct names to the various types of forceps.

There are two chief forms—the depressed, rather short, and bowed forceps of *P. caffra* and *P. bettoni*, and the more elongate and slender forceps of *P. frontalis* and *P. separata*.

I am now inclined to think that Sjöstedt's specimens should be assigned, at least provisionally, to *P. separata*. It is certainly nearer to it than it is to *P. bettoni*, Kirby, in which the forceps approach rather to the type represented by *P. caffra*, Karsch.

Genus V. CRANOPYGIA, nov.

Pronotum subrectangulare, angulis ipsis rotundatis; segmentum penultimum ventrale ♂ angustum, lanceolatum, acuto-rotundatum; segmentum ultimum dorsale ♂ angulis externis utrinque in cristam acutam plicatum; ceteris cum genere *Pygidicrana* congruet.

Type, *P. cumingi*, Dohrn.

This genus will include those species with a narrow penultimate ventral segment and a subrectangular pronotum.

Table of Species.

1. Forceps ♂ superne dente cristato armatus; elytra rufescens, nigro-limbata; pronotum vittis nigris 2 ornatum	1. <i>cumingi</i> , Dohrn.
1.1. Forceps ♂ superne inermis; elytra fusca; pro- notum fusco-testaceum, lineis 3 pallidis	2. <i>nietneri</i> , Dohrn.

C. nietneri varies in depth of colour from light yellowish red to almost black; the curvature of the forceps also varies considerably; in one male in my collection the right branch is toothed and excavate on the inner margin near the apex; in the same specimen the apex of the penultimate ventral segment has a faint emargination which I cannot detect in other specimens.

Genus VI. PICRANIA, nov.

Caput angustum, pronoto haud vel vix latius; pronotum longum angustum, parallelum; elytra brevia; tarsi longi, graciles; abdomen angustum, fere parallelum.

Type, *Pygidicrana liturata*, Stål.

I erect this genus for the two species with narrow heads. *P. liturata*, Stål, from S. Africa and Diego Suarez, has a very characteristic appearance and coloration. The other species, *P. angustata*, Dohrn, from Ceylon, is only known from the female type in the Berlin Museum.

Table of Species.

1. Abdomen in parte basali rufescens, lineis 4	
nigris signatum: species africana	1. <i>liturata</i> , Stål.
1.1. Abdomen rufescens, fulvo-marmoratum:	
species ceylonica	2. <i>angustata</i> , Dohrn.

Genus VII. PYGE, nov.

Pronotum subquadratum; scutellum amplum, transversum, pronotum latitudine fere aut omnino aequans, medio sulculatum; elytra brevia, angulo axillari excavato, hoc modo scutellum magnum liberantia; costa interdum carinata; aëe rudimentariæ; pedes breves; femora compressa; tarsi breves, haud tenues, segmento primo tertium aequanti vel subbreviori; segmentum ultimum dorsale amplum; segmentum penultimum ventrale angustum, rotundato-acutum; forcipis brachia ♂ ♀ brevia, contigua, depressa.

Type, *Pygidicrana modesta*, Borm.

This genus is formed for the reception of those species in which the elytra are excavated at the axillary angle, thus exposing the characteristic ample scutellum. The elytra are also short and narrow. There is sometimes a distinct keel on the costal margin; the wings are abortive, sometimes represented by a pair of leathery flaps showing under the shortened elytra.

The species are confined to the Oriental and Australian Regions, and do not appear to be common.

They are of relatively small size and the colour is usually dull brown or black, sometimes relieved by some yellow.

Table of Species.

1. Scutellum tam latum quam pronotum.	
2. Pronotum bivittatum	1. <i>vitticollis</i> , Stål.
2.2. Pronotum haud bivittatum.	
3. Pronotum scutellum elytra rufescensia.	2. <i>piepersi</i> , Burr *.

* 'Notes from the Leyden Museum,' xxx. p. 95 (1908).

3.3. Pronotum nigrum, flavo-signatum.
 4. Prozona nigra, metazona flava,
 nigro-maculata..... 3. *atriceps*, Kirby.*
 4.4. Pronotum nigrum, utrinque flavo-
 limbatum 4. *modesta*, Borm.
 1.1. Scutellum pronoto brevius 5. *ophthalmitica*, Dohrn.

Pyge atriceps, Kirby.

P. atriceps, Kirby, is a curious species, in which the pronotum has a very characteristic coloration; the prozona is entirely black and the metazona clear yellow, with an ill-defined black spot in the centre. At first glance it appears that the wing-scales are yellow; as a matter of fact, it is the first dorsal segment which is clear yellow and shows up beyond the very short elytra, which are quite black, so that this yellow segment is in striking contrast, especially as the rest of the abdomen is black. The wings themselves are present as small black leathery flaps, just exposed under the costa of the elytra. This appearance is so deceptive that it misled Kirby, who described the wing-scales as yellow, an easy slip to make. The elytra themselves are rather narrowed at the apex, and the surface is scabrous. The fold separating the dorsal from the lateral surfaces is marked by a row of granulations that form a keel.

The species is described from Rockhampton in Queensland. I have two from the Mallee District in Victoria.

It is possible that this species is identical with *P. ophthalmica*, Dohrn, recorded from Moreton Bay (Queensland) and also from Tenasserim, but the examples from the latter locality may prove to be distinct.

The following species which have been included in *Pygidicrana* remain to be ranged in this system:—

P. guttata, Borm. (Celebes): probably in *Dicrania*. *P. quadriguttata*, Kirby, is a synonym.

P. papua, Borm. (New Guinea): probably in *Pygidicrana*.

P. peruviana, Rehn (Peru), is a *Pyragra*, judging from the illustration.

P. livida, Borelli (East Africa): the male is unknown; probably in *Dicrania*.

P. egregia, Kirby (Brazil): male unknown; apparently allied to *P. v-nigrum*.

P. bivittata, Erichs. (Brazil): apparently related to *P. v-nigrum*.

P. notigera, Stål (Brazil), is only known to me by the description; it is probably a true *Pygidicrana*.

P. caffra, Dohrn, and *P. dæmeli*, Dohrn, are only known to me by their description and by drawings; the position which I have allotted them by analogy may well be correct.

P. abnormis, Borm., is the type of *Tomopygia*, Burr (1904).

P. büttneri, Karsch, is the type of *Karschiella*, Verhoeff.

MISCELLANEOUS.

Contributions towards a Revision of the Genus Lomanotus: *a Postscript.*

I REGRET to find that the survey of the literature of the genus *Lomanotus* given in the paper which appeared under the above title in the August issue of these 'Annals' is incomplete, in so far as it includes no reference to Sir C. Eliot's valuable "Notes on some British Nudibranchs," contributed to vol. iii. of the 'Journal of the Marine Biological Association' in 1906. Unfortunately the existence of these "Notes" did not come to my knowledge until some three weeks after the appearance of the August issue of the 'Annals.' Having read the section of the "Notes" dealing with *Lomanotus* (pp. 348-353) I find it necessary to alter my views as to the position of *L. portlandicus*. Hancock's unpublished drawings show that this species possesses what appears to be the most important specific character of Trinchesse's *L. eisigii*, a fin-like caudal process, so that the two species may be considered as identical. While still retaining two species in the genus, I desire, then, to alter the arrangement proposed in the August number of the 'Annals' (pp. 217-218) to the following, *L. portlandicus* (1860) taking precedence of *L. eisigii* (1883):—

(1) *L. marmoratus*, Ald. & Hanc. (1845).

L. genei, Vérany (1846).

L. hancocki, Norman (1877).

(2) *L. portlandicus*, Thompson (1860).

L. eisigii, Trinchesse (1883).

Whether this provisional arrangement is to stand will depend on the value that may be conceded as a specific distinction to the fin-like caudal process of the second species as described by Trinchesse and figured by Hancock.

N. COLGAN.

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XLVII.—*On the Forms of Squirrel hitherto classed under Sc. finlaysoni, Horsf.* By R. C. WROUGHTON.

THIS question was discussed by Dr. Anderson in 1879 (*Zool. Western Yunnan*). He came to the conclusion that the following forms, viz. *finlaysoni*, *ferrugineus*, *keraudreni*, *splendidus*, *cinnamomeus*, *siamensis*, *splendens*, *germani*, *bocourti*, and *leucogaster*, were "only varieties of one and the same species."

It was again investigated by Bonhote in 1901 in dealing with a collection of mammals from Siam (*P. Z. S.* p. 53). The result was rather unsatisfactory, for while keeping all the forms under the specific name *finlaysoni*, he recognized four "types," but did not distinguish the forms which ranked in each "type."

Since then there have been considerable additions of specimens of this group to the collection of the Natural History Museum, and on laying out the whole and sorting them both geographically and by pattern it seemed to me possible to introduce some commencement of order in the arrangement of the group.

As a preliminary it may be noted that a study of the literature shows that the following names disappear from the list quoted above as synonyms, viz. *keraudreni*, Less., = *ferrugineus*, Cuv.; *siamensis*, Gray, and *splendens*, Gray, = *cinnamomeus*, Temm.; *leucogaster*, M.-Edw., and *leucocephalus*, Bonh., = *bocourti*, M.-Edw.

By the courtesy of Dr. H. O. Forbes, of the Liverpool Museum, who sent Gray's type for inspection, I am in a position to state that *Sc. splendidus* has nothing to do with this group and must be deleted from the list. On the other hand, *harmandi*, M.-Edw. (from the island Phu Kok), must be added to it.

Of the new list thus formed, *finlaysoni*, Horsf., *germani*, M.-Edw., and *harmandi*, M.-Edw., represent island forms which are apparently quite fixed and show no signs of intergradation with any other forms. I propose to rank them all as distinct species.

A large black form from the sea-coast south of Bangkok, though a mainland form, also shows absolutely no signs of intergradation with other forms, nor, indeed, so far as our material goes, of variation of any sort, and should therefore be accepted as a good species.

The black feet in *ferrugineus*, the all-red squirrel of Pegu, are so absolutely constant and characteristic that it too must be given specific rank.

The all-red squirrel of Siam, *cinnamomeus*, Temm., is a somewhat doubtful case. Temminck based his *cinnamomeus* on three specimens, and he felt obliged to describe each one as a separate variety. Gray based his *splendens* on four specimens from Cambodia, and he, too, described each of them as a separate variety. Gray's *siamensis* is a very young specimen, labelled merely "Siam"; it is unlike any other form I know, in pattern; until more material shows that it belongs elsewhere, I have left it as a synonym of *cinnamomeus*. Hence it is evident that the red squirrel of Cambodia varies enormously, but I have failed to detect any intergrading with neighbouring forms. Mr. Lyle has sent a long series of a quite similar red squirrel from the upper valley of the Me Nam, and there, curiously enough, the form seems to be "fixed," and to correspond fairly closely with one of Gray's varieties of *splendens* and also with two specimens in this Collection from Chantaboon and the adjoining island Phu Kok. Finally, both among the southern series and the northern Me Nam series, side by side with the red specimens appear pure white ones, and of the white specimen from the Me Nam, at any rate, Mr. Lyle records that it has black eyes. Notwithstanding this extraordinary tendency to variation, however, in the absence of any proof of intergradation with other forms I feel myself justified in treating *cinnamomeus* as a good species.

Finally, we have a number of forms inhabiting the Bangkok River with its feeders the Me Nam and the Me Ping.

The first of these, extending the whole way along the main stream and a short way along the eastern tributary, has already received from Milne-Edwards the name *bocourti*. It may be described broadly as grizzled above, pure white below, with a greyish-brown tail obscurely barred with ferruginous; but in a series of twenty specimens the only constant character is a white belly (and even this is replaced by a red-brown one in two other specimens); the dorsal ground-colour varies from almost black, through brown, to a pale grey, and the white of the lower surface extends in a varying degree to the head, the feet, the tail, and even partially to the back. Higher up the Me Nam and on the lower and upper Me Ping are found three forms which, though intergrading with each other and to some extent with *bocourti*, seem in those three localities to have attained a certain modified fixity, and are, in my opinion, worthy of being described as subspecies.

The following is a key to the group as I now propose to arrange it:—

Key.

A. Unicoloured.

a. All red.

- a¹.* Feet black. (Pegu.) (1) *ferrugineus*, Cuv.
- b¹.* Feet golden red. (Siam.) (2) *cinnamomeus*, Temm.

b. All black.

- a¹.* Size large: hind foot 51 mm.; skull 54. (Bangkok.) (3) *nox*, sp. n.
- b¹.* Size small: hind foot 42 mm.; skull 47. (Pulo Condor.) (4) *germani*, M.-Edw.
- c.* All white. (Sichwan Island.) (5) *finlaysoni*, Horsf.

B. Parti-coloured.

a. Hind foot 53 mm.; tail with no red colouring. (Phu Kok.)

- (6) *harmandi*, M.-Edw.

b. Hind foot at most 49 mm.; distal ¾ of tail maroon or bay.

- a¹.* Belly white; bullæ parallel-sided. (Bangkok River.)

- (7) *bocourti*, M.-Edw.

- b¹.* Belly coloured; subbasal white patch on tail; inner face of bullæ swollen.

- (8) *b. sinistralis*, subsp. n.

- a².* Grizzled brown and buff, with a few all-white hairs; hind foot 43 mm. (Upper Me Nam Valley.)

- (9) *b. dextralis*, subsp. n.

- b².* Grizzled brown and buff, with about half the hairs all white; hind foot 46 mm. (Lower Me Ping Valley.)

- (10) *b. lylei*, subsp. n.

- c².* Smoke-grey; hind foot 49 mm. (Chiengmai.)

(1) *Sciurus ferrugineus*, F. Cuv.

1829. *Sciurus ferrugineus*, F. Cuvier, Mamm. pl. cxxxviii.
 1830. *Sciurus keraudreni*, Lesson, Cent. Zool. pl. i.

Cuvier gives for this animal the vague habitat "India," but Lesson, who recognizes in a footnote (*l. c.*) that his animal is the same as *ferrugineus*, locates it "from the vast forests of Pegu."

Sc. ferrugineus is a uniform red-brown (between hazel and chestnut) except (as pointed out by both the authors quoted above) that the extreme tip of the tail is white and the hands and foot black.

The Museum has a series of six specimens presented by Major Harington, who collected them at Rangoon. They agree without variation with the above description.

Dimensions of an old male:—

Head and body 230 mm.; tail 225; hind foot 52; ear 20.

Skull: greatest length 56; basilar length 44; zygomatic breadth 33; brain-case breadth 25; interorbital breadth 19; nasals, length 16·5, proximal breadth 4·2, distal breadth 8; diastema 12·5; upper molar series 11.

(2) *Sciurus cinnamomeus*, Temm.

1853. *Sciurus cinnamomeus*, Temminck, Esq. p. 250.
 1860. *Sciurus siamensis*, Gray, Ann. & Mag. Nat. Hist. v. p. 500 (juv.).
 1861. *Sciurus splendens*, Gray, P. Z. S. p. 137.

This is a most variable form. The type of *siamensis* is a quite young animal, but is interesting in being entirely grizzled orange-red on black, above. The four specimens described as varieties 1, 2, 3, and 4 of *splendens* by Gray I have examined. Vars. 3 and 4 are very pale specimens (paler than orange-rufous), and one of them shows traces of grizzling on the limbs and cheeks; var. 1, on the other hand, is a very dark specimen (near bay), unicoloured except for an abnormal white patch on the tail, which recalls the similar patch characteristic of *Sc. bocourti sinistralis*, *lylei*, &c. Var. 2 is intermediate between these extreme forms, and, I believe, represents the normal one. A specimen collected by Capt. S. S. Flower at Chantaboon agrees closely with it, though still showing faint traces of grizzling on the limbs and cheeks. Finally, there is a series of six specimens collected by Mr. Lyle on the upper Me Nam which differ little from this type except that the under surface is darker, and thus the whole animal is unicolorous (near cinnamon-rufous). The tendency to develop a white tail-tip is evident in all these specimens, and

from both Cambodia (*Capt. S. S. Flower*) and the upper Me Nam (*Mr. J. H. Lyle*) absolutely white specimens have been received which were found side by side with the red variety. Mr. Lyle specially notes that these white specimens have black eyes. Face to face with such bewildering variation I have concluded to accept Gray's "*splendens* var. 2," *Capt. Flower's Chantaboon specimen*, and *Mr. Lyle's series* from the upper Me Nam as the normal of the species.

Dimensions of an adult female of *Mr. Lyle's series* :—

Head and body 220 mm.; tail 236; hind foot 5½; ear 20.

Skull: greatest length 56; basilar length 45; zygomatic breadth 32; brain-case breadth 25; interorbital breadth 19·5; nasals, length 16, proximal breadth 4, distal breadth 8; diastema 13·5; upper molar series 11.

This species differs from the preceding in the complete absence of the black-coloured feet, the constant presence of which is so characteristic of *ferrugineus*.

(3) *Sciurus nox*, sp. n.

Size rather smaller than *cinnamomeus*.

Colour uniform jet-black above and below.

Dimensions of type (taken in the flesh) :—

Head and body 207 mm.; tail 164 (broken, probably 210); hind foot 51; ear 21.

Skull: greatest length 53·5; basilar length 42·5; zygomatic breadth 32; brain-case breadth 26; interorbital breadth 18·6; nasals, length 16·3, breadth proximally 4·5, breadth distally 7·3; diastema 12; upper molar series 10.

Hab. Sea-coast south of Bangkok.

Type. Old male. B.M. no. 6. 10. 7. 4. Original number 214. Collected by Mr. T. H. Lyle on 7th August, 1906, and presented by him to the Natural History Museum.

A series of eight specimens, of which one is quite young. There is not the smallest sign of variation through the whole series.

(4) *Sciurus germani*, A. M.-Edw.

1867. *Sciurus germani*, A. Milne-Edwards, Rev. Zool. p. 198.

The type-locality is the island Pulo-Condor, off the coast of Cambodia. Milne-Edwards gives the head and body as 230 mm. and the tail of equal length, but he was dealing with skins. Judging from two specimens from the same island in the Museum Collection, the following are approximate dimensions of this species :—

Head and body 190 mm.; tail 190; hind foot 42; ear 20.
 Skull: greatest length 47; basilar length 37; zygomatic breadth 28; brain-case breadth 22; interorbital breadth 17·3; nasals, length 15, proximal breadth 3·5, distal breadth 6·3; diastema 10·6; upper molar series 9·6.

These skull-measurements are taken from a rather old individual.

(5) *Sciurus finlaysoni*, Horsf.

1824. *Sciurus finlaysoni*, Horsfield, Res. Java.

The type-locality is the island of Sichang.

The animal is completely white and is expressly stated to have black eyes and black soles to the feet.

Dimensions of the type (an old animal):—

Head and body 175 mm.; tail 175; hind foot 43; ear 20.
 Skull: greatest length 46; basilar length 36·5; zygomatic breadth 28; brain-case breadth 22; interorbital breadth 17·3; nasals, length 13, proximal breadth 4·5, distal breadth 7·3; diastema 11; upper molar series 8.

(6) *Sciurus harmandi*, A. M.-Edw.

1870. *Sciurus harmandi*, A. Milne-Edwards, Bull. Soc. Philom. (6) xii. p. 8.

The type-locality is Phu Kok, an island off Chantaboon.

General colour above near "walnut-brown," but almost completely hidden by white, the individual hairs each half grey, half walnut-brown, in that order from the base upwards; with a very large proportion of longer, white, black-tipped hairs; below white, largely tinged with walnut-brown. Cheeks and throat darker. Limbs brown, faintly grizzled with buff; hands vinaceous cinnamon, feet cinnamon-rufous. Tail like back at immediate base, thereafter mixed black and white, i. e. hairs black with white tips (according to M.-Edwards these white tips are tinged with reddish in the type).

Milne-Edwards gives the dimensions as: head and body 260 mm.; tail 250—but these were probably taken on a skin or stuffed specimen. The true size is apparently exactly the same as that of *cinnamomeus*.

The following are measurements of an adult skull:—

Greatest length 56 mm.; zygomatic breadth 32; brain-case breadth 24·5; interorbital breadth 20; nasals, length 16, breadth proximally 4·5, breadth distally 7·2; diastema 12·5; upper molar series 11.

The dorsal pattern is like that of *bocourti dextralis*, but the black and white tail serves to distinguish it at once.

(7) *Sciurus bocourti*, A. M.-Edw.

1867. *Sciurus bocourti*, A. M.-Edwards, Rev. Zool. p. 193.
1867. *Sciurus leucogaster*, A. M.-Edwards, Rev. Zool. p. 196.
1901. *Sciurus leucocephalus*, Bonhote, P. Z. S. p. 54.

The type-locality of *S. bocourti* was Ayuthia, on the river north of Bangkok. *S. leucogaster* came from "Pexabury," close to Bangkok, and is evidently a young individual of this species. The Museum has a long series from Ayuthia, collected by Capt. S. S. Flower, and others from various points on the river still further north, and some from the Me Nam feeder as far north as Pichit, collected by Mr. T. H. Lyle, beyond which point it is replaced by the next form. It is a form which varies extraordinarily in colouring. Milne-Edwards gives the ground-colour as "un fauve roux et noirâtre"; in a series of over twenty specimens I find all grades of colour, from almost black, through "seal-brown" and "chocolate," to a quite pale "smoke-grey," in all cases grizzled with pale buff. The under surface is white, but in certain individuals this extends to the feet, in others to the face and head also, and in yet others the tail has become white. Finally, in the series from Ayuthia are two abnormal individuals in which white is entirely absent, even the belly is chestnut. These specimens approach the form next described, except for the absence of the subbasal pale spot on the tail which so constantly characterizes the latter.

Dimensions of an adult male:—

Head and body 192 mm.; tail 198; hind foot 45; ear 20.

Skull: greatest length 50; basilar length 39; zygomatic breadth 31; brain-case breadth 23; interorbital breadth 18·5; nasals, length 15, breadth proximally 3·5, breadth distally 7·7; diastema 11·2; upper molar series 10·5.

(8) *Sciurus bocourti sinistralis*, subsp. n.

Slightly smaller than typical *bocourti*.

General colour above black or "clove-brown," grizzled (finely) with buff, with a certain number of all-white hairs sprinkled over the back. Face, including the ears, suffused with bright "hazel." Under surface near "hazel"; hands and feet dark, almost black. Tail for a short distance (30 mm.) coloured like back, then for some distance (45 mm.) almost white (the hairs white, with black tips), the rest of the tail bright "bay," an obsolescent black and buff barring still traceable at the bases of the hairs.

Dimensions of the type (measured in the flesh):—

Head and body 191 mm.; tail (c.) 190; hind foot 43; ear 20.

Skull: greatest length 49; basilar length 38; zygomatic breadth 30; brain-case breadth 22·6; interorbital breadth 18; nasals, length 14, breadth proximally 4·3, breadth distally 7; diastema 11; upper molar series 9·6.

Hab. Me Nam River (type from "below Pichit," alt. 117').

Type. Adult male. B.M. no. 3. 8. 5. 8. Original number 186. Collected June 8th, 1903, by Mr. T. H. Lyle, and presented by him to the Museum.

A series of eight specimens from various points on the Me Nam from its junction with the Me Ping northwards to Pitsanulok. Two or three of these specimens show, by an increase of the all-white hairs scattered through the coat, an approach to the next form, from the Me Ping. A series of four individuals from a western feeder of the Me Nam all show a similar modification.

(9) *Sciurus bocourti dextralis*, subsp. n.

Size rather larger than either *b. sinistralis* or typical *bocourti*.

General colour above as in *b. dextralis*, but the proportion of all-white hairs greatly increased (to almost one-half of the whole) and the face more brightly coloured. Under surface a dark shade of cinnamon-rufous approaching chestnut.

Dimensions of the type (taken in the flesh):—

Head and body 206 mm.; tail 184; hind foot 46; ear 20.

Skull: greatest length 52; basilar length 41·5; zygomatic breadth 30; brain-case breadth 24; interorbital breadth 18·3; nasals, length 16, breadth proximally 3·5, breadth distally 7·3; diastema 12; upper molar series 10·3.

Hab. River Me Ping Valley (type from Kampeng, alt. 375').

Type. Adult female. B.M. no. 0. 10. 7. 9. Original number 109. Taken 3rd Feb., 1900, by Mr. T. H. Lyle, and presented by him to the Museum.

A series of six specimens, from various points on the Me Ping, from its junction with the Me Nam northwards to Raheng, are, on the whole, fairly uniform, but one specimen from Raheng approaches, by the almost complete substitution of white hairs (some of them black-tipped) for the usual black with buff tips, to the following more northerly form.

(10) *Sciurus bocourti lylei*, subsp. n.

Size largest among the forms of *bocourti*.

General colour above smoke-grey, individual hairs mouse-grey basally, then white, a large proportion with black tips. Face and head faintly washed with orange-rufous. Tail basally (50 mm.) coloured like the back, then (50 mm.) white, and finally bright cinnamon-rufous. Hands and feet finely grizzled black and white. Under surface a pale bright orange-rufous.

Dimensions of type (taken in the flesh):—

Head and body 213 mm.; tail 200; hind foot 49; ear 20.

Skull: greatest length 51 (54)*; basilar length 40 (43); zygomatic breadth 30 (32); brain-case breadth 23·5 (24); interorbital breadth 18 (20); nasals, length 14 (16·5), breadth proximally 4, breadth distally 7; diastema 11·1 (12·6); upper molar series 10·3.

Hab. Chiengmai on the Me Ping.

Type. Adult female. B.M. no. 7. 11. 13. 11. Original number 242. Taken by Mr. T. H. Lyle on 12th August, 1907, and presented by him to the Museum.

Three specimens examined, all very like one another. The complete absence of either red or brown in the coat (above), the bright orange-rufous belly, the obsolescence of the red colouring on the head, and the paler hands and feet make this a very striking form among the subspecies of *bocourti*.

XLVIII.—*On a new Type of Stridulating-organ in Mygalomorph Spiders, with the Description of a new Genus and Species belonging to the Suborder.* By A. S. LIRST.

SEVERAL types of stridulating-organs are known to occur in the spiders of the suborder *Mygalomorphæ*. These organs consist of arrangements of spines and bacillæ, the structure and disposition of which differ much in the groups and genera in which they are present. In some of the groups of the subfamily *Aviculariinæ* (*Thrigmopœæ* &c.) the apparatus lies between the posterior surface of the mandible and the anterior surface of the maxillipalp, and this is also the case in some of the genera of the *Dipluridæ*. In other groups of

* The figures in brackets are those of a rather older individual.

the Aviculariinae (Phoneyuseæ &c.) the stridulatory organ (when present) is placed between the posterior surface of the maxillipalp and the anterior surface of the coxa or trochanter of the first leg. In a few genera in which this latter type of apparatus occurs the part which is borne by the first leg is present on both coxa and trochanter.

In some of the genera of the Ischnocoleæ there is present a type of stridulating-organ which has hitherto escaped notice and which differs in several important respects from those referred to above. In this form of apparatus the structures are situated between the inner (anterior) surfaces of the mandibles themselves. It differs, moreover, from all the forms of stridulating-organs hitherto described as occurring in Mygalomorph spiders in that the opposed surfaces of the appendages do not bear dissimilar series of bacillæ and spines, the structures of the two halves of the organ being precisely similar in form and arrangement. In the spiders of the genus *Selenogyrus* a well-marked apparatus of this type is present. It consists of a number of rows of bacillæ arranged in a somewhat crescentic manner, the bacillæ of the outer rows being the largest. Three or four of the posterior bacillæ are of large size and form a separate group (fig. 1). In a new genus of Ischnocoleæ from the Cameroons, here described, a different modification of this form of stridulating-organ is present. The inner surface of the mandible is furnished with numerous spines which are grouped in a somewhat irregular fashion. A few of these spines are enlarged and are of peculiar form (fig. 2). In an Indian Ischnocolid from Travancore, which belongs to an undescribed genus and species, the stridulating-apparatus presents itself in a much reduced form. An oblique row of five strong spines is present towards the base of the inner surface of the mandible. A few weak spines are placed behind this row of strong spines, and some of the setæ of the inner surface of the mandible have their ends slightly enlarged (fig. 3). In *Metriopelma auronitens*, Keyserling *, there occurs a peculiar structure which differs much from the stridulating-organs described above. The inner surface of each mandible is provided with a raised area which partly encircles and encloses a dense brush of long and slender bristles. These bristles are curved, their free ends being directed towards the ventral edge of the mandible. It remains to be seen if this structure is a stridulating-organ. I have only been able to

* E. Keyserling, 'Die Spinnen Amerikas: Brasilianische Spinnen,' 1891, p. 16.

examine a single specimen (the typical male) of *M. auronitens*, Keyserling. There is no trace of this structure in the typical specimen (a female) of *M. pantherina*, Keyserling*, which is supposed by Pocock to be the female of *M. auronitens*. It is possible, however, that this organ is confined to the one sex.

EUPHRICHTUS, gen. nov.

Anterior row of eyes slightly procurved, the posterior row almost straight. Cephalothoracic fovea minute and procurved. Labium armed with many spinules (the spinules are more numerous than is represented in fig. 4), the maxillæ

Fig. 1.



Mandible of *Selenogyrus aureus*, Pocock, from the inner side.

Fig. 2.



Mandible of *Euphrictus spinosus*, sp. n., from the inner side.

also spinulose. Posterior sigillæ of sternum of small size, widely separated from one another and separated by about twice their length from the margin of the sternum. Inner surfaces of the mandibles furnished with a stridulating-organ

* T. c. p. 18.

of the type detailed above. Spine of the palpal organ long and with the terminal part slender and pointed (fig. 5). Tibia of first leg with no trace of spurs, but furnished with apical, ventral, and lateral spines. Tarsi of the anterior legs with the scopulae divided by a line of setæ; tarsi of the fourth pair of legs with the scopulae divided by a fairly broad band of setæ.

Fig. 3.



Mandible of an undescribed genus and species of *Ischnocoleus* from the inner side.

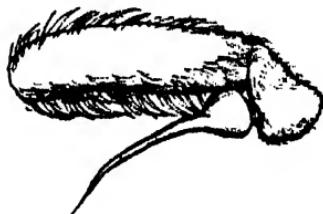
Fig. 5.

Fig. 4.



Fig. 4.—Labium of *Euphrictus spinosus*, sp. n., from above.

Fig. 5.—Outer view of palp-organ of *Euphrictus spinosus*, sp. n.



Euphrictus spinosus, sp. n.

Colour (worn specimen).—Carapace yellowish, abdomen with the inner scale-like hairs of the dorsal surface brown, the long hairs light yellowish; ventral surface of the abdomen much lighter in colour.

Carapace equal in length to the patella, tibia, and tarsus of the maxillipalp, and very nearly equal to the length of the metatarsus of the fourth leg.

Anterior median eyes a little further from one another than from the anterior laterals; posterior median eyes almost touching the posterior laterals. Eyes of anterior row considerably larger than the eyes of the posterior row.

Abdomen.—Terminal segment of spinnerets by far the longest.

Legs.—Patellæ and tibæ of first and fourth legs almost equal in length. Patella and tibia of second leg equal to the metatarsus of the fourth leg. Metatarsi of anterior legs scopulate for more than half their length; metatarsus of first leg armed below with a large spine and also with a small apical spine. Tibia of first leg armed ventrally and laterally with 7-9 spines, three of which are apical. Metatarsi of third and fourth apically scopulate. Tibiæ and metatarsi of third and fourth legs armed ventrally and laterally with a number of spines. Tarsi of palp and legs furnished dorsally with a number of clavate hairs.

Palp.—Spine of palpal organ long and twisted (fig. 5).

Mandible with stridulatory organ as described above (fig. 2).

Measurements in mm.—Total length of body 15.5; length of carapace 7.75, of first leg (from base of femur) 26, of fourth leg 29, of patella and tibia of first leg 9.5, of patella and tibia of fourth leg 9; of patella, tibia, and tarsus of palp 7.75.

Locality.—A single adult male from the River Ja, in the Cameroons, collected by Mr. G. L. Bates.

Remarks.—A mutilated and immature specimen from the same locality, which seems to belong to an allied species, possesses a well-marked rastellum. The teeth are twelve in number and form a border to the inner edge of the mandible. In the type of *Euphrictus spinosus* they are represented by a number of spiniform setæ.

XLIX.—Descriptions of new Species of New-Zealand Coleoptera. By Major T. BROUN, F.E.S.

[Continued from p. 352.]

Group Feronidæ.

Trichosternus cælocephalus, sp. n.

Robust, suboblong, moderately convex, nitid, blackish green, margins metallic green; legs rufo-piceous; the labrum, antennæ, and palpi pitchy red, these last more rufescent, with their tips still paler.

Head moderately large, not as broad as thorax, its sides and occiput appearing quite convex, owing to the whole

central portion, from the middle of the eyes to the base of the labrum, being considerably depressed; eyes prominent, their orbits swollen below and behind; labrum arcuate emarginate. *Thorax* $2\frac{1}{2}$ lines long by $3\frac{1}{2}$ broad; apex obviously incurved, the base less so; widest near the front, moderately rounded near the middle, gradually narrowed towards the acutely rectangular posterior angles; marginal channels wide and a little expanded behind; the dorsal sulcus attains the basal margin, near which it is most conspicuous, there is a curvate frontal impression, the basal fossæ are large. *Elytra* oblong-oval, strongly sinuate apically, humeral angles dentiform and projecting so as to distinctly exceed the base of the thorax in width; they are evidently striate, with fine punctures; the sutural two interstices are plane, the others distinctly convex, all of about equal breadth; the third has four, the seventh five or six large punctures, marginal sculpture coarse.

Underside glossy black, without well-marked sculpture; terminal ventral segment with two setigerous punctures at each side of the middle at the apex. *Legs* normal, external angle of intermediate tibiae prolonged, so as to cover the basal half of the first tarsal joint.

When compared with *T. antarcticus*, the apical portion of the elytra is seen to be more sinuously narrowed and the humeral angles more prominent; the labrum is more deeply incurved. The most remarkable character, however, which distinguishes this from every other species of *Trichosternus* is the cavity which occupies so large a portion of the head.

♂. Length 12; breadth $4\frac{1}{4}$ lines.

Ashburton. Discovered by Mr. W. W. Smith.

Trichosternus hanmerensis, sp. n.

Suboblong, shining, nigrescent, lateral margins slightly viridi-cupreous; legs, antennæ, and palpi piceo-rufous.

Head smooth, inter-antennal impressions well developed. Eyes large and prominent; genæ simple. *Thorax* $3\frac{1}{2}$ lines in breadth by $2\frac{1}{2}$ in length, widest near the middle, its sides gently rounded, moderately sinuously narrowed behind, posterior angles rectangular, base and apex widely emarginated; disk but little convex and almost smooth, dorsal groove distinct but feeble at apex, basal fossæ large and expanded towards the angles. *Elytra* at the base rather wider than thorax, rather more so at or behind the middle, humeral angles dentiform, sinuously yet only moderately narrowed apically; they are punctate-striate, the punctuation is fine*

but distinct, the sutural two interstices plane, the others only moderately convex, all are more or less marked with transverse feeble aciculate impressions, the third has two or three, the seventh five or six setigerous punctures.

Underside glossy black, nearly smooth, only feebly wrinkled, the terminal ventral segment with two setigerous punctures at the extremity at each side of the middle in both sexes; prosternal process unimpressed.

♂ ♀. Length $9\frac{1}{2}$ - $10\frac{1}{2}$; breadth $3\frac{1}{2}$ lines.

Hamer. Found by Mr. J. H. Lewis.

Obs.—The six individuals under examination exhibit certain variations. In one female the hind body is $4\frac{1}{2}$ lines in width. It would be unwise to separate the series into distinct species at present, so I will simply note varietal forms.

A.—Apical sinuosities deeper, hind body more oviform, no punctures on the third interstices. One male.

B.—Lateral margins and the elytra with rufescent reflections; base of thorax very slightly incurved and scored with fine longitudinal impressions; the thorax itself less curvate laterally, less narrowed, and not at all sinuate behind, the thoracic and humeral angles of almost exactly the same width. One male.

C.—Elytral interstices flatter, punctuation of striæ less distinct; humeral angles evidently broader than basal angles of thorax, which measures $2\frac{1}{2}$ lines in length by $3\frac{1}{2}$ in breadth, its margins slightly rufescent, more strongly rounded laterally, disk uneven, dorsal groove at the middle interrupted by an oviform elevation, basal fossæ irregular, apex with fine longitudinal striæ, some transverse ones near basal fossæ. One damaged female.

Trichosternus ordinarius, sp. n.

Shining, head and thorax coppery green; base and lateral margins of elytra viridescent, disk blackish green; legs piceous, tarsi and basal joints of antennæ piceo-rufous, remaining joints infuscate red; labrum fuscous, with somewhat testaceous margins.

Head (mandibles included) one-third longer than and (eyes included) as broad as thorax; smooth, with moderate frontal impressions. *Thorax* subquadrate, apex evidently incurved, with rounded angles; its sides are only slightly curvate near the front and very gradually but not at all sinuously narrowed towards the rectangular but not projecting posterior angles; the basal fossæ are large and deep, and the marginal channels are widened near the base; the central sulcus is rather broad

and deep at the base and slightly foveiform at its apparent termination near the front, it is, however, prolonged to the front margin as a slender stria, the broad curvate impression near the front is most evident near the angles; the disk is slightly convex and shows traces only of transverse striae; the base is slightly medially emarginate: it is a fourth broader than long. *Scutellum* striate at base. *Elytra* distinctly broader than thorax at the base, humeral angles evidently dentiform; they are rather wider near the hind thighs than elsewhere and considerably, obliquely, and sinuously narrowed towards the extremity; their striae are moderately broad and deep and finely punctured; the sutural two interstices are rather narrow, the others broad and convex, the third has three, the seventh five punctures. The *eyes* are prominent. There are two setigerous punctures on each side of the middle of the last ventral segment at the apex in both sexes.

Underside shining piceous, head viridescent.

Female.—Thorax slightly more rounded laterally; hind body broader, particularly near the apex; thorax less cupreous on the middle.

♂. Length 10 $\frac{1}{2}$; breadth 3 $\frac{1}{2}$ lines.

Hórowhenua Lake. One pair from Mr. G. V. Hudson.

Little difficulty will be experienced in separating this species from *T. cephalotes* or *T. hudsoni*, its nearest allies. The nearly straight-sided thorax, posteriorly attenuated elytra, and more slender legs are distinctive.

Zeopæcilius optandus, sp. n.

Suboblong, slightly convex, nitid, blackish green; thorax brilliant brassy and red, elytral margins rufescent; the legs and basal joints of antennæ piceous; tarsi and palpi piceorufous.

Head convex, as broad as front of thorax, feebly irregularly wrinkled; frontal impressions rather short; it is green. *Thorax* one-fourth broader than long, its sides moderately strongly rounded, but with a slight incurvature towards the rectangular posterior angles; discoidal groove and basal fossæ well marked; there is a slight curvate impression near the front, the base and apex bear distinct abbreviated longitudinal striae, and there are numerous feeble undulating striae across the disk. *Scutellum* feebly striate. *Elytra* oblong-oval, rather gradually narrowed and only slightly sinuated posteriorly, humeral angles dentiform; their striae regular, moderately deep, and finely punctured, the interstices mode-

rately convex, slightly undulate behind, all (including the suture) marked with shallow fine punctures.

Underside shining violaceous black, nearly smooth. Terminal ventral segment with one setigerous puncture only at each side of the middle at the apex, as in *Z. putus* and *Z. princeps*.

Posterior tibiae with a stout flexuous calcar; basal joint of the tarsi compressed, broadly grooved underneath, and ridged along the inner side.

Z. princeps (no. 1457) can be distinguished by its red tibiae, *Z. putus* by the dark colour and longer elytra. In *Z. calcaratus* the first joint of the posterior tarsi is not laterally compressed, whilst in *Z. achilles*, which I have not seen, the corresponding joint appears to be dilated inwardly.

♂. Length 10 $\frac{1}{2}$; breadth 3 $\frac{3}{4}$ lines.

Nelson. I am indebted to Mr. G. V. Hudson for my specimen.

Pterostichus turgidiceps, sp. n.

Elongate, subdepressed, only slightly nitid, nigrescent; the antennæ and tarsi piceo-rufous; palpi infuscate red.

Head (mandibles included) one-fifth longer than thorax, nearly as broad as that is; the genæ and ocular orbits swollen, the former nearly straight from the base of the mandibles to behind the eyes; ocular carinae simple, the two frontal impressions moderate, the surface smooth; there are two setigerous punctures near each eye and two on the forehead; on the labrum there are six; both forehead and labrum are widely incurved in front. Mandibles very thick, rather long, and slightly curved at the extremity. Eyes rather small, not flat, yet not at all prominent. Antennæ with yellow pubescence from the fourth joint onwards; the first three and the base of fourth are glabrous. Thorax almost as long as broad, apex very slightly emarginate, with obtuse and not in the least prominent angles; the base somewhat obliquely emarginate towards the middle; lateral margins simple but well developed, of equal thickness throughout, with four setigerous punctures at each side; it is widest near the front and gradually narrowed, but not perceptibly sinuate, towards the rectangular but not acute posterior angles in the female; in the male the posterior sinuosity is evident, so that the angles appear slightly projecting though not acute, its sides are gently rounded but not as broad in front as in the female; disk rather flat, the central groove not abbreviated, basal

fossæ rather longer than broad and situate nearer the sides than to the middle; there is a feeble curvate frontal impression. *Scutellum* slightly striate at base. *Elytra* a little longer than the head and thorax combined, suboblong, rather wider behind than at the base, where they barely exceed the thorax in breadth; humeral angles obtusely dentiform, posterior sinuosities oblique but not deep, apices quite obtusely rounded, lateral margins well developed; the dorsum flat; each elytron with eight very finely punctured striae; interstices moderately broad, the third and fifth with five or six, the seventh with eight or nine conspicuous punctures, the sides with coarse serial punctures.

Legs moderately long, thick, femora dilated.

Male.—*Tarsi*: anterior with the basal three joints strongly dilated and cordiform, with grey spongy squamæ, and fringed with ferruginous setæ underneath; their fourth joint also cordate; the posterior rather short, basal articulation rather longer than second, the basal four intermediate between cordate and triangular, the terminal somewhat thickened towards the extremity.

Female.—*Labrum* so much abbreviated that its punctured apex only is visible, so that the trophi are quite exposed between the open mandibles. Front tarsi with subcordate intermediate joints, the basal and terminal of nearly equal length. Size $8 \times 2\frac{1}{2}$ lines.

Mentum tooth bifid. Basal ventral segment almost wholly concealed. Both sexes with two setigerous punctures on each side of the middle, at the extremity, of the last ventral segment.

♂. Length $9\frac{1}{2}$; breadth $2\frac{1}{4}$ lines.

Manawatu Gorge. One of each sex, discovered on different occasions, by Mr. W. W. Smith.

Obs.—Certainly a very curious species. The structure quite Pterostichoid. The legs are thick, like those of an African *Anthia*. The thorax of the female resembles that of a North-American *Holciphorus* in shape. The elytra are somewhat like an Australian *Homalosoma*. The swelled head is considered a colonial characteristic and is like that of our *Trichosternus planiusculus*.

Pterostichus odontellus, sp. n.

Elongate-oblong, moderately convex, brilliant and intensely black; legs piceous; tarsi, antennæ, and labrum piceorufous, palpi paler.

Head nearly as wide as thorax, the forehead a little uneven

and depressed, with several fine longitudinal rugæ near the eyes; the common frontal impressions are ill-defined and appear to form part of the depression between the antennæ. *Eyes* large and prominent, their orbits somewhat swollen. *Labrum* large, truncate, with six setigerous punctures. *Thorax* $2\frac{1}{4}$ lines in breadth by $1\frac{1}{2}$ in length; base and apex slightly emarginate; widest at the middle, its sides only moderately rounded, more narrowed towards the base than it is in front, with an almost imperceptible sinuosity near the subacute posterior angles; anterior angles rounded, the marginal channels of equal width throughout; discoidal furrow deep, distinctly abbreviated in front, basal fossæ large and elongate; its surface uneven but without well-defined impressions. *Scutellum* scored at base. *Elytra* suboblong, slightly wider behind than at the base, but sinuously narrowed apically; they are evidently striate, the eighth striæ are punctate, the sculpture of the discoidal striæ, however, is ill-defined, seeming to consist of shallow elongate impressions with slight intervals, some of these appear to encroach on the interstices.

Underside shining black, bipunctate at each side of the middle, at the apex, of the last ventral segment. Prosternal process broadly and deeply furrowed along its whole length.

Legs stout; the intermediate femora strongly inflated, the anterior and posterior remarkably so, being quite bulbous underneath, the hind trochanters very thick and cylindric; tibiæ stout, the hind pair with a small tooth on the inner edge near the middle. Anterior tarsi with coarse brush-like soles; the basal four joints cordiform, the first three more expanded than the fourth, the basal two appear as if their outer angles were slightly prominent.

Antennæ pubescent from the fourth joint onwards, they attain the base of the thorax; second joint more than half the length of the third; the basal joint is stout and cylindric and bears a distinct flattened tubercle close to its upper extremity and an upstanding seta at the inner side of the tubercle.

♂. Length 8; breadth $2\frac{1}{2}$ lines.

Taranaki.

Mr. W. W. Smith, who seems to possess the knack of finding curious Carabidae, gave me his unique specimen without mentioning the locality; but I believe he found it near Mount Egmont.

Obs.—This conspicuous beetle is of special interest. The remarkable femora, the denticles on the posterior tibiæ and on the basal joints of the antennæ are without precedent. The dilated joints of the front tarsi, though unsymmetrical,

are not sufficiently so for generic separation from *Pterostichus*. It must be located in the section having four or more setigerous punctures on each side of the thorax.

Pterostichus antennalis, sp. n.

Elongate, slightly convex, black; the legs and basal three joints of the antennæ piceous, remaining joints pale castaneous.

Head about as broad as front of thorax, very finely and irregularly wrinkled, frontal impressions elongate; eyes only moderately prominent, their orbits a good deal dilated below and behind. *Thorax* 5 mm. long by $5\frac{1}{2}$ broad, moderately incurved medially at base and apex, anterior angles rounded, its sides but little curved, and gradually slightly narrowed behind; the posterior angles, owing to the thickening of the margins, appear minutely prominent; its surface very finely transversely striate, the base and apex longitudinally, discoidal groove well marked and almost touching the apex, basal fossæ rather elongate, and with a second smaller almost sulciform one nearer each side, the space between each of these latter and the lateral margin seems convex but not cariniform. *Scutellum* striate at base. *Elytra* elongate, oblong, but little rounded laterally, distinctly sinuated behind, humeral angles moderately dentiform and but little wider than the base of thorax; each elytron with seven more or less interrupted striæ, all well marked at the base, the inner four rather more regular and finer than either of the next two, each consists of about twenty punctures or elongate impressions, the seventh is made up of about twenty or more rather fine punctures between the shoulder and posterior sinuosity.

Femora medially dilated, the posterior strongly angulate, so that the trochanter fits into the slender basal portion. There are four setigerous punctures on each side of the thorax and at the apex of the last ventral segment.

The terminal four joints of the antennæ are rufo-castaneous, with a piceous central streak, which is broadly grooved, sometimes with a slender carina, and this dark longitudinal space is marked off by the entire absence of the pubescence which is so conspicuous on all but the basal three. This peculiarity occurs amongst the allied species, but I have not seen any record of it.

In *P. lewisi* the elytral striæ are almost entirely made up of elongated impressions, the seventh has only about seven or ten; two of these grooves sometimes occupy the whole space between the hind thigh and subapical sinuosity. In the

present species the seventh striæ consist of a combination of over twenty rather fine punctures and impressions. This will enable the student to distinguish the species.

♂. Length $8\frac{1}{2}$ -9; breadth $2\frac{3}{4}$ -3 lines.

Takuratahi and Mount Holdsworth. Two males from Mr. G. V. Hudson's collection.

Pterostichus oneroensis, sp. n.

Black, glossy; tibiæ and antennæ nigro-piceous; tarsi rufo-piceous; labrum and mandibles also black.

The description of *P. sandageri* (no. 1776) applies exactly to this, with the following exceptions:—

The elytral interstices are transversely marked with aciculate impressions and the two large punctures on the third are absent. The prosternal process is broadly grooved and the metasternum is similarly impressed longitudinally. The legs are more robust, the intermediate femora are much swollen underneath, so as to appear more emarginato towards the apex; the tibiæ of the same pair have their hind or outer anglos produced as a stout spiniform process. This last character, however, is also present in *P. sandageri*.

There are two setigerous punctures on each side of the thorax—one before the middle, the other at the hind angle—and the same number at each side of the middle, at the apex, of the last ventral segment. It belongs to the *Trichosternus*-like section (see Man. N. Z. Coleopt. p. 986).

♂. Length $12\frac{1}{2}$; breadth 4 lines.

Te Oneroa (Mr. P. Seymour); Invercargill (Mr. G. V. Hudson). One specimen from each.

Pterostichus flectipes, sp. n.

Suboblong, moderately convex, shining cupreous black; legs and antennæ piceous.

Head convex, frontal impressions distinct, and with a series of fine longitudinal interocular striae. *Thorax* 3 lines in width by $2\frac{1}{4}$ in length, base and apex much incurved, widest near the middle, moderately curved forwards, narrowed and slightly sinuate towards the rectangular posterior angles, marginal channels of almost equal width throughout; median groove distinct from base to apex, basal fosse large; across the disk there are several feeble aciculate impressions. *Scutellum* striate. *Elytra* oblong-oval, shoulders dentiform but not prominent; with finely punctured striæ; interstices slightly convex, the third with two, the seventh with five punctures.

Legs stout, femora but little inflated; intermediate tibiae truncate at extremity, the posterior much bent throughout their whole length, the terminal calcar rather stout and nearly as long as the first tarsal joint.

Underside glossy black, metasternum and ventral segments finely irregularly wrinkled, last segment bipunctate at each side of the extremity, the prosternum apparently smooth, flanks of mesosternum minutely coriaceous.

Belongs to the *Trichosternus*-like section, with one setigerous puncture at each hind angle of the thorax and another before the middle. In some respects like *P. meliusculus* (1637), but smaller, the hind body more decidedly oviform, humeral angles less dentiform, basal region of thorax not medially depressed, punctuation of elytral striae more distinct. It may be separated from all the members of this section by the remarkably formed posterior tibiae.

♂. Length $9\frac{1}{2}$; breadth $3\frac{1}{4}$ lines.

South Island.

One of Commander J. J. Walker's captures; exact locality unknown, probably Westport.

Pterostichus adoxus, sp. n.

Suboblong, subdepressed, nitid, pitchy black; elytra very slightly æneous and their margins rufescent behind; legs piceo-rufous, the palpi, antennæ, and tarsi paler red.

Head smooth, with simple, small, and shallow frontal foveæ and a shallow impression on the middle of the vertex; including the large prominent eyes, it is quite as wide as front of thorax; there are two setigerous punctures close to each eye, and the same number on the forehead. *Antennæ* with the basal three joints nude, third joint as long as fourth and a fourth longer than second, they attain the middle femora. *Thorax* slightly wider before the middle than elsewhere, moderately rounded and margined, widely but not deeply sinuate, angustate behind, posterior angles rectangular, base and apex subtruncate; it is a little convex and just a fifth broader than long; the well-marked central groove extends from base to apex; basal fossæ large, elongate, and extending as a flattened space to each hind angle, they are finely punctate. *Scutellum* obsoletely sculptured. *Elytra* oblong-oval, with rounded and not dentiform humeral angles, lateral margins well developed, moderately narrowed, but hardly at all sinuate posteriorly; each has a scutellar and seven well-marked discoidal striae, all impunctate; the sutural stria on each is bent at the apex and prolonged forwards.

along the lateral margins; interstices nearly plane, the third tripunctate.

The tips of the palpi are very slightly obtuse. The basal three articulations of the front tarsi in the male are appreciably less dilated than in *Haptoderus maorinus* (88) and *sharpianus*. The latter is the nearest ally known to me, but its thorax is broader, more rounded, its hind angles are less acutely rectangular, and the fossæ less evidently (sometimes not at all) punctured, and there are no interstitial punctures on the elytra. The two hind pairs of tarsi are similarly grooved, and all three species have one seta on each side of the thorax before the middle and another at the hind angle.

♂. Length 4; breadth 1 $\frac{1}{8}$ line.

Manawatu Gorge. One male, secured by Mr. W. W. Smith.

Pterostichus oxymelus, sp. n.

Oblong, medially narrowed, slightly convex, brilliant black; tarsi and basal four joints of antennæ rufo-piceous, remaining joints rufo-fuscous; palpi shining, rufo-piceous, with fulvescent tips.

Head large, as long as thorax, and (eyes included) nearly as broad as that is; frontal impressions elongate and deep, more or less finely wrinkled; eyes prominent; labrum obliquely emarginate. Thorax widest before the middle, moderately rounded, a good deal curvally narrowed and slightly sinuate behind; posterior angles rectangular, slightly incrassate and prominent, the anterior rounded; apex and base widely incurved, the latter subtruncate near each side; discoidal furrow deeply impressed and a little expanded towards the extremities, but not reaching the apex; basal fossæ longer than broad, well developed, situate nearer the sides than the middle; there are a few fine longitudinal striae near the middle of the base and apex, but no perceptible ones across the disk; it is only an eighth broader than long. Scutellum deeply striate at base. Elytra oblong-oval, shoulders rather narrow and not dentiform; they are only moderately narrowed and rounded and only slightly sinuate behind; they are slightly convex, their striae are moderately deep and finely punctured, but some become a little irregular and interrupted towards the extremity.

Legs robust; femora strongly dilated, posterior angulate below; front and middle tibiae incrassate near extremity, the posterior flexuous, strongly and acutely prolonged at the inner extremity, the two apical spines unequal and elongate, both bent backwards.

When compared with *P. mucronatus* (1468), *P. oxytelus* appears to have stouter legs, the mandibles are evidently obliquely striate; the eyes are more convex and prominent, but their orbits are less swollen; the elytral striae are more regular and less interrupted, the shoulders are not at all prominent, the posterior contraction is less abrupt and deep; the apical spines of the four hind tibiae are directed backwards instead of forwards, as they are in *P. mucronatus*; the basal three joints of the front tarsi are less expanded and the second and third are foveate above near the base.

There are four setigerous punctures on each side of the thorax, but only one at each side of the middle at the extremity of the terminal ventral segment.

♂. Length $7\frac{1}{2}$; breadth $2\frac{1}{2}$ lines.

Manawatu Gorge. One, found by Mr. W. W. Smith.

Pterostichus sinuiventris, sp. n.

Intense black, glossy; the palpi, tarsi, and basal four joints of antennae rufo-piceous, tips of palpi fulvescent.

Head almost smooth, with elongate frontal foveæ; mandibles obliquely striate; labrum obliquely emarginate. Eyes convex and prominent, their orbits not swollen. *Thorax* one-seventh broader than long, widest before the middle, gently rounded, moderately sinuate-angustate behind, posterior angles rectangular and slightly projecting; apex widely, the base medially, incurved; basal fossæ large and elongate, central furrow broad and deep but not reaching the apex. *Scutellum* deeply striate at base. *Elytra* oblong-oval, humeral angles slightly projecting, posterior sinuosities rather deep and abrupt, the apex, however, rather broad and obtusely rounded; they are rather deep and finely punctate, regular, but becoming confused near the extremity; interstices smooth and moderately convex.

Legs stout, femora dilated; posterior tibiae slightly flexuous, not prolonged at the inner extremity.

Female.—Terminal ventral segment near each side of the apex obliquely truncate towards the middle, which is angulate and somewhat prominent, the whole apex distinctly marginated and with a fine groove parallel with the margin, and bearing two setigerous punctures near each side, as in the male. Flanks of the sternum finely punctate or rugose. The head and thorax more or less finely transversely striate.

Similar to *P. oxytelus*, but lacking the essential character of that species, i. e. the acute prolongation of the posterior tibiae. The elytral striae deeper and regular. The thorax

more sinuate behind and with more prominent angles. The shoulders more dentiform and the claws of the front tarsi thicker. There are four setæ on each side of the thorax.

♂. Length $6\frac{1}{2}$; breadth $2\frac{1}{2}$ lines.

Manawatu Flats, 9 miles below the Gorge. One male and three females, collected by Mr. W. W. Smith and Mr. Frank Park.

Pterostichus vexatus, sp. n.

Elongate, glossy black; legs and basal four joints of antennæ piceous; palpi and tarsi piceo-rufous.

Head moderately large and (including the prominent eyes) as wide as front of thorax; frontal impressions elongate, mandibles finely wrinkled, labrum emarginate. *Thorax* subquadrate, its sides being only slightly rounded, and a little narrowed but not sinuate behind; posterior angles rectangular, apex widely, base medially incurved; disk very slightly convex, median furrow well marked, rather deep and broad at extremities, but not attaining the base or apex; basal fossæ not very large, well defined, distinctly separated from the sides, the curved frontal impression very feebly marked; it is only an eighth broader than long. *Scutellum* striate at base. *Elytra* oblong, slightly rounded, rather abruptly sinuate-angustate near the apices, humeral angles not dentiform and but little wider than the thoracic angles; disk subdepressed, their striae irregularly interrupted, some of the punctures large and distant, those of the intermediate especially, sixth and seventh rather more regularly striate-punctate.

Legs stout, posterior femora dilated, angulate and subdentate below, so that the trochanters exactly fit into the narrow basal portion.

Male with one setigerous puncture each side of the middle, but rather far apart, at the apex of the last ventral segment; the female with two. Anterior tarsi with the basal two joints of the male slightly but appreciably prolonged at the outer angle.

Belongs to the section having four setæ on both sides of the thorax, and most nearly allied to *P. obsoletus*, which, however, has a more posteriorly narrowed and slightly sinuated thorax and evidently shorter elytra. In both species the hind tibiae are slightly curvate, but *P. vexatus* is larger and has stouter legs. *P. ithaginis* is also somewhat similar, but its thorax is more narrowed behind and the elytral striae are much less interrupted. *P. præcox*, also from Wellington,

has its thorax more narrowed basally, with larger fossæ and differently sculptured elytra. These are the only species with which it may be confounded.

♂. Length $7\frac{1}{2}$; breadth $2\frac{1}{4}$ lines.

Wellington. One pair from Mr. J. H. Lewis.

Pterostichus perbonus, sp. n.

Oblong, moderately elongate and convex, nitid, black; legs and antennæ piceo-rufous.

Head (including the prominent eyes) rather narrower than thorax, the elongate frontal impressions well marked. *Thorax* $2\frac{1}{2}$ lines broad by $1\frac{1}{2}$ long, base and apex incurved, slightly wider before the middle than it is elsewhere, a little narrower behind than in front, its sides very gently and regularly rounded, and without any sinuosity whatever; lateral margins well developed, posterior angles quite obsolete; dorsal groove abbreviated, the curvate frontal impression feeble; basal fossæ simple, not long, situated nearer the sides than the middle; usually with feeble linear impressions across the disk. *Scutellum* striate at base. *Elytra* a little wider than thorax, oblong-oval, their shoulders rather narrow, rounded, and not at all dentiform, only slightly sinuate apically; their striæ are deep, regular, and not perceptibly punctured; interstices generally with many feeble aciculate impressions across them, the third sometimes tripunctate; the scutellar striæ short but deep.

Legs normal, posterior femora dilated and subangulate.

Underside glossy black, flanks of prosternum feebly wrinkled, mesosternum punctate. Terminal ventral segment bipunctate at each side of the middle at the apex in both sexes.

P. ovatellus, Chaudoir, is no doubt the nearest species, but in it the elytral striæ are punctured. There are only two setæ on each side of the thorax.

♂. Length $7\frac{1}{2}$; breadth $2\frac{1}{2}$ lines.

Westport.

Commander J. J. Walker, R.N., gave me a pair bearing the number 5240.

Pterostichus philpotti, sp. n.

Subparallel, elongate, moderately convex, glossy black; legs and antennæ rufo-piceous, terminal joints of the palpi rufo-castaneous.

Head smooth, with rather feeble frontal impressions; mandibles distinctly wrinkled; eyes large and prominent.

Thorax $1\frac{1}{4}$ lines in length and breadth, slightly wider near the front than it is behind, its sides very slightly curved, margins well developed; the base medially incurved and slightly obliquely rounded towards each side, so that the angles are obsolete, the apex subtruncate or just perceptibly emarginate; disk smooth, central groove distinct but not attaining the apex; basal fossæ large and well defined, placed nearer the sides than the middle. *Scutellum* striate at base. *Elytra* elongate, very little wider than thorax, subparallel, shoulders somewhat curvally narrowed, so as to scarcely exceed the base of thorax in width, rather broad at the extremity, and with only a short sinuation near it; the striae are not deep, they are somewhat confused near the apex and are finely punctured, the punctuation of the third and fourth sometimes effaced, seventh indistinct, the punctures near the lateral margins rather large and distinctly separated; interstices but little convex, with two punctures on the third behind the middle.

Legs stout; posterior femora not angulate below; intermediate tibiae slightly dilated along the inner face.

There are four setæ along each side of the thorax; there are no scutellar striolæ.

Of peculiarly elongate subparallel outline. Like *P. inconstans*, but differing from it in the darker legs, absence of catenulate elytral sculpture, and by the deeply striate scutellum, &c.

♂. Length 7; breadth 2 lines.

West Plains, Invercargill.

One pair from Mr. A. Philpott, whose name it bears.

Pterostichus lepidulus, sp. n.

Subdepressed, elongate, moderately shining, black; legs piceous, the front tarsi and last seven joints of antennæ rufouscous; the basal four joints of the latter, the palpi, and mandibles pitchy red.

Head nearly as long and (including the very prominent eyes) as broad as thorax, with fine oblique rugæ near each eye, frontal impressions not elongate; labrum widely emarginate. *Antennæ* reach backwards to base of thorax, fourth joint very slightly longer than third. *Thorax* widest near the middle, moderately rounded, gradually narrowed behind, posterior angles rectangular, base medially incurved, apex slightly emarginate, it is one-fourth broader than long; disk nearly flat, basal fossæ elongate, sulciform, situated halfway between the middle and sides, dorsal furrow well marked but

not reaching the front margin. *Scutellum* finely striate. *Elytra* oblong, humeral angles rounded and not dentiform, moderately curvedly narrowed, but hardly at all sinuate posteriorly; they are nearly plane, and have finely and closely punctured but not deep striae; interstices rather flat, the third tripunctate; the marginal sculpture well marked, the seventh striae very fine.

The mandibles are rather short, but strongly curved and acute at the extremity. Femora simple. Thorax bisetose at the sides, last ventral segment also.

P. oscillator, Sharp, is certainly the nearest ally. This species differs in having more shallow, but distinctly though finely punctured elytral striae, scored scutellum, &c. In my specimen of *P. oscillator* the lower sides of the head, between the eyes and middle of mandibles, are expanded and rufescent, and in this respect resemble the Antarctic genus *Loxomerus*. In *P. lepidulus* the dilatation is normal and does not extend beyond the base of the mandibles.

♂. Length 6; breadth 2 lines.

West Plains, Invercargill. A single specimen from Mr. A. Philpott.

Pterostichus chalmeri, sp. n.

Elongate-oblong, glossy black; the legs and basal four joints of antennæ rufo-piceous, remaining joints infuscate red; tarsi and palpi piceo-rufous.

Head (eyes inclusive) rather narrower than front of thorax, frontal foveæ short, not extending backwards to the eyes; labrum large, widely incurved; eyes moderately prominent. *Thorax* a fourth broader than long, widest before the middle, moderately rounded, a good deal narrowed backwards, posterior angles rectangular, the anterior rounded, apex widely but slightly incurved; base subtruncate, being only a little emarginate at the middle; disk slightly convex, with feeble yet quite perceptible transverse striae, the curvate frontal impression shallow; basal fossæ broad, with a second smaller outer fovea united to each; discoidal furrow distinct but not attaining the apical margin. *Scutellum* deeply striate at base. *Elytra* oblong; humeral angles obtusely dentiform; they are but little narrowed and only slightly sinuate posteriorly; they are distinctly and regularly punctate-striate, the striae are deep but not distinctly punctured at the base, the marginal punctures are well marked; interstices slightly convex, simple.

Legs stout, hind thighs angulate and minutely dentiform

underneath; basal three joints of anterior tarsi rather broadly expanded. There are two setæ on both sides of the thorax, but only one at each side of the terminal ventral segment.

P. thoracicus (1148) may be at once separated by its more finely punctured and sharply impressed elytral striae, less transverse thorax, with the duplicate basal and smaller foveæ distinctly marked off from the larger ones, and by the more sinuate and narrower elytral apices. *P. placidus* (1150) is distinguished by its more prominent thoracic angles; its basal fossæ are similar, but the punctuation of the elytral striae is finer and the apical portion of the hind body is narrower; the scutellum is longitudinally scored to its apex. The third interstice is only indistinctly bent forwards and elevated near the apex, so that the oblique cariniform elevation seen in the two species cited is less conspicuous in *P. chalméri*, in which, moreover, the head is not constricted behind the eyes.

♂. Length 6; breadth $2\frac{1}{8}$ lines.

Dunedin. One, sent by Mr. T. Chalmers, formerly an assiduous collector of Coleoptera in Otago.

Group Bembidiidæ.

Tachys coriaceus, sp. n.

Shining, slightly convex, rufo-testaceous; the greater portion of elytra (except the suture and apex) infuscate; legs testaceous; tarsi, palpi, and antennæ pale yellow.

Head narrowed anteriorly; frontal impressions elongate, extending from back of eyes to apex, they are deep and broad and finely transversely sculptured; a fine lateral carina proceeds from the back part to each antenna. Eyes very small. The antennæ reach backwards to the base of thorax and bear slender grey setæ; basal two articulations stout, cylindric, and of nearly equal length; joints 3-8 longer than broad, subovate, but a little narrowed towards the base, tenth evidently shorter, eleventh as long as but rather stouter than third, with three apical setæ, the central one distinct. Thorax transverse, with well-defined lateral margins, base and apex subtruncate, its sides rounded, more strongly in front than behind, the margins minutely thickened behind, but without forming distinct angles there; basal foveæ small, dorsal groove abbreviated; it has a few minute setigerous punctures, one seta at each side, before the middle, is most conspicuous. Elytra oval, of about equal width at base and apex, distinctly margined, estriate, with a few minute indistinct punctures,

each of which has a fine grey seta; their whole surface densely and very minutely sculptured.

Legs elongate, yet not very slender; anterior tarsi not ditated. Palpi stout, penultimate articulation straight externally, slightly rounded inwardly.

From *T. latipennis*, Sharp, the thoracic angles at once differentiate it. It is most nearly allied to *T. oreobius*, but the broader form, evidently more transverse thorax, with more rounded anterior angles and more distinct lateral margins, distinguish it therefrom. The head also differs; in *T. oreobius* the frontal impressions are most obviously separated by the apparently raised central space, but in *T. coriaceus* the space between the side and each fovea appears most distinct.

♀. Length $\frac{7}{8}$; breadth $\frac{3}{8}$ line.

Otira Gorge. One female, discovered by Mr. J. H. Lewis.

Drury, Auckland, N.Z.,
26th May, 1908.

L.—*On the Animals of Genera and Species of Mascarene Land-Mollusca belonging to the Family Zonitidae, collected by Monsieur E. Dupont.* By Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S. &c.

[Plates IX.-XI.]

ON commencing this paper I must convey my best thanks to Monsieur E. Dupont for collecting so carefully and sending me so much valuable material to examine and describe. I have also to thank Mr. John Ponsonby for supplying me with some species obtained in the first instance by the same conchologist. As the first consignment was received as far back as 1906, I have to regret the long delay in its publication. With regard to the animals of Mascarene land-shells I find not many have been described.

Messrs. Thomas Bland and W. G. Binney, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia,' vol. xxvi. 1874, p. 47, describe the anatomy of some Mauritian land-shells belonging to the genus *Gonospira*, and of others with which I am more interested belonging to the Zonitidae and placed in Gray's genus *Nanina*. "Such are *N. caldwelli*, Ba.; *N. rawsonis*, Barclay, = *semicerina*, Morelet; *N. argentea*, Rve.; *N. implicata*, Nevill; *N. stylodon*, Pfr., put in *Helix* (*Erepta*) by Von Martens."

Then follows a very important notice which I will quote in full :—"Entirely different in the dentition is another species, *N. philyrina*, Morelet, though the species agrees in other respects with the above-named. The membrane is very broad, the teeth exceedingly numerous, arranged in oblique rows. The centrals, which I am confident of having seen, are small, narrow, high. The other teeth are the same in form to the edge of the membrane. They appear to have the usual aculate form of the marginal teeth in *Nanina*, but instead of narrowing towards the cutting-point, they are broadly and obliquely truncated, reflected, and minutely denticulated. This lingual ribbon is also figured by Semper (Phil. Archip. pl. vi. f. 35), but his figures give more the impression of the usual *Nanina* marginals with denticulated sides and bifid points. The teeth are, however, so exceedingly numerous and small, it is very difficult to understand them." This species is made the type of *Caldwellia* by H. Adams (*vide P. Z. S. 1873, p. 209*), and *cernica*, H. Adams, with *imperfecta*, Desh., probably belong to it, both Mauritian.

In this description we have distinct evidence of the sub-family Durgellinae of India and Malayana extending to the Mauritius; the finely decussated and keeled shell *philyrina* is very unlike any species of the Indian genera of the sub-family, and will probably have to be put in a new genus. "Elsewhere (Ann. N.Y. Lyc. N. H. x. 170) we have described the lingual of the following Mauritius species :—*Nanina inversicolor*, *leucostyla*, *rufizonata*, *militaris*. We have examined two genitalia of *N. inversicolor*. The oviduct is long, narrow, sac-like; the genital bladder is hardly smaller than its long wide duct; the penis is long, *extended into a flagellum*, receiving the vas deferens near its apex, beyond it having a bulb-like termination; the vas deferens is greatly swollen in its middle portion, and near the base of the oviduct has a long flagellate appendix."

Still quoting Messrs. Bland and Binney concerning the species *inversicolor*, *leucostyla*, and *rufizonata* which they had received from Mr. Pike, the United States Consul at the Mauritius, it is stated that *inversicolor* and *militaris* were placed by Von Martens in *Helicacea*, genus *Helix*, the former in the section *Caracolus*, type of which is *H. caracolla* from Porto Rica, and the latter in *Styloodon*, type *unidentata* of the Seychelles; "but both, as well as *rufizonata* and *leucostyla*, belong to the Vitrinea, genus *Nanina*, of Von Martens' classification. Indeed our figure of lingual dentition of *N. calias*, Benson ("American Journal of Conchology," vol. vii. p. 188, pl. xvii. fig. 6), well applies."

The animal from which this radula was extracted was said to come from the foot of the Himalayas. I must point out here that an error in determination was made. It cannot be that of *N. calias*, which is a *Sophina* and type of that genus of Benson only found in Tenasserim. It has a radula of a very peculiar and aberrant type (*vide* 'Land and Freshwater Mollusca of India,' ii. p. 221, pl. cxv. figs. 5, 5 a, and pl. cxvi. fig. 3). The radula figured is that of a *Macrochlamys*, but unfortunately the species cannot now be determined. The description of the foot applies well to this Indian genus.

Genus EREPTA, Albers.

Erepta, Albers, Die Heliccen, 1850, p. 109.

Original description:—"Testa imperforata, depressiuscula, solidula; anfractus 6, ultimus subangulatus; apertura lunaris, columella brevis, obliqua, dente valido truncata, peristoma simplex, margine basali subincrassato."

Type *Helix stylodon*, Pfr., Isle de France.

The animal of this species I have not as yet been able to obtain.

Genus PACHYSTYLA, Mörch.

Pachystyla, Mörch, Cat. Yoldi, 1852.

Type *inversicolor*, Fér. No description.

I have not yet seen the animal of this species, but from the description of the genitalia given above by Messrs. Bland and Binney it appears to be of the type of those described in this paper.

In 1858 H. & A. Adams, in their 'Genera of Recent Mollusca,' p. 224, adopted *Pachystyla*, but neglecting *inversicolor*, take two other Mauritian shells as typical examples, viz. *mauritiana* and *ochroleuca*, Féris., which in shell-character are very unlike the Albers type. *Erepta* is made a subgenus of *Styloclista*, p. 187.

In the 1860 edition of 'Die Heliccen,' Eduard von Martens included in *Erepta* the species *stylodon*, Pfr. (original type), *mauritiana*, Pfr., *barclayi*, Bs. (belonging to a different genus), *odontina*, Morelet, *mauritianella*, Morelet, *lightfooti*, Pfr., and *suffulta*, Bs.; the last two are the same as *odontina*, and *mauritianella* is the same as *mauritiana*.

Paul Fischer, Man. de Conchyliologie, 1887, p. 461, adopts *Pachystyla* as a section of *Ariophanta*, with subgenera *Calatura* and *Rotula*; these differ very widely from any species of the *Ariophantinæ* and cannot be retained in it.

In this paper I select *Erepta* to represent these Mauritian

forms—*Pachystyla*, *Rotula*, &c. being subgenera based mostly upon shell-character alone.

Erepta leucostyla, Pfr. (Pl. IX. figs. A, A 1.)

= *mauritiana*, Pfr., = *mauritianella*, Morelet.

Locality. Mauritius (*E. Dupont*).

Animal. Grey throughout. Foot divided, the mucous pore large, extremity of foot truncate. The peripodial grooves present, but their parallelism is not very distinct, nor is the margin of the foot fringed, it is plain and concolorous.

Membrane of the branchial cavity finely mottled upon the margins of the veins, defining them well.

There are no shell-lobes; the right dorsal lobe is small, the left dorsal lobe in two parts.

Genitalia (fig. A). The shell being closely wound, the different organs are much elongated. In the penis the epiphallus (*ep.*) (*i. e.* the portion between the retractor muscle and *vas deferens* junction) is very long, and at this last point a peculiarly long cæcum calciferum or flagellum (*f.*) is given off. There is no amatorial organ. The spermatheca (*sp.*) is extremely long, buried in the folds of the ovo-testis (*ov.*), and extending close up to the albumen-gland.

The jaw (fig. A 1) is moderately arched with a central projection.

The radula (fig. A 1) has the formula

$$\begin{array}{c} 68 . 1 . 17 . 1 . 17 . 1 . 68 \\ \quad 86 . 1 . 86 \end{array}$$

The outermost lateral teeth, up to the number of about 30, are very minute, bicuspid, so are all the rest, the inner point slightly the longest. The admedian teeth and central tooth are of the usual form seen in *Macrochlamys* &c.; they are rather short, not elongate, on rather broad basal plates. The radula extracted was complete and had 118 rows.

Erepta rufizonata, H. Adams. (Pl. IX. fig. B.)

= *ochroleuca*, Féussac.

Locality. Mauritius (*E. Dupont*).

The shell of this species is much smaller than the preceding, but very similar in its general form, and quite distinct conchologically. The animal is dark grey, with two narrow parallel white streaks on dorsal side of the neck and

head. Branchial membrane much mottled with black. The animal in its characters is similar to that of *E. leucostyla*. The generative organs (fig. B) are precisely the same, the very long flagellum (*f.*) included.

The jaw and radula are similar, the only difference lying in the formula, this being

$$15 + . 1 . 12 . 1 . 12 . 1 . 15 + \\ + 28 . 1 . 28 +$$

The outermost laterals were lost when removing the radula.

The species from the islands of the Mascarene group examined by Semper and described in his 'Reisen im Archipel der Philippinen,' p. 39, are *caelatura*, Fé., and *rufa*, Lesson, both from Bourbon. The generative organs of these are figured on plate iii. figs. 22 & 23. In every respect they are like those of the Mauritian species now under review, with this exception, that the flagellum and spermatheca of the Bourbon species are both shorter; but this slight departure is not, I consider, sufficient to separate them generically. Semper placed them in Albers's genus *Rotula*, of which Albers made *detecta* the type—a Bourbon species: this I have not been able to obtain and see what the animal is like, but, in all probability, it will turn out to be like *caelatura*, &c.* Semper also places in *Rotula* two other species from widely separated localities, viz.: the first, *R. massoni*, Behn, from the Andaman Islands, which, from a single specimen I have examined, appears to be more closely allied to *Macrochlamys*: the second is *R. campbelli*, Gray, from Philipp Island, near Melbourne; the generative organs of this species do not accord with those of *Rotula rufa*. I therefore come to the conclusion that the genus *Rotula* can only be considered a subgenus of *Erepta*, based on its shell-character, which is very distinctive and is well described by Albers: "Teste imperforata, lenticularis, late carinata, costulata striata; anfractibus 5, convexi, suturæ appressi, ultimus ba-i convexus; apertura securiformis; peristoma simplex, margine basali vix incrassato." *Erepta*, created many years previously, must be adopted for these shells from Bourbon and Mauritius. *Erepta* may possibly be found in the Comoro Islands as well, while it will be very interesting to discover if it extends to Madagascar or South Africa.

* This species *detecta* I have received, since these pages were in type, from Mr. Ponsonby. The generative organs in all respects are similar to those of *Erepta rufzonata*, and there is every indication of the spermatophore being like that figured in Pl. XI. figs. 2 & 3. There is no accessory organ, and the flagellum is not extremely long.

Among South Indian and Ceylon shells which I have examined there is nothing at all approaching the form of the generative organs of *E. leucostyla* and *E. rufozonata*; thus they form a well-marked genus of the Zonitidæ in this part of the world, and, when we know more of the species of this family in Africa, may possess subfamily rank. I may further point out that Semper gives a figure of the spermatophore of *E. (Rotula) rufa* (pl. iii. figs. 24, a, b): this shows a very well-marked form, which I hope to find in some of the preserved specimens sent home by Monsieur E. Dupont, to whom I must again tender my thanks for the assistance he has given me.

Subgenus *CÆLATURA*, Pfeiffer.

Erepta (Cælatura) cælatura, Fér. (Pl. IX. figs. D, D.)

Rotula cælatura, Semper, Reis. im Archipel d. Philippinen, p. 39, pl. iii. figs. 22 a, b; pl. vii. fig. 1.

Nanina (Rhynota) cælatura, Fér. Nev. Hand-list, i. p. 46 (1878).

Locality. Brûlé, St. Denis, Bourbon (*E. Dupont*).

Animal. The left dorsal lobe is in three separate lappets.

The buccal mass is very globose in form.

The generative organs agree exactly with Semper's figure on plate iii.; the flagellum is not so thin and lengthened as in *E. leucostyla* and *E. rufozonata*.

The radula has the formula

82 . 2 . 22 . 1 . 22 . 2 . 82, or 106 . 1 . 106

The jaw: cutting-edge slightly concave with slight central projection.

Erepta (Cælatura) rufa, Less. (Pl. IX. fig. C.)

Rotula rufa, Semper, Reis. im Archip. d. Philippinen, p. 39, pl. iii. figs. 23, a, b, 24, a, b; pl. vii. fig. 3.

Nanina (Macrochlamys ou Rotula?) semifusca, Deshayes.

Helix semifusca, Desh. Voy. Ind. pl. i. figs. 8-10.

Helix rufa auctorum (non Lesson).

Mr. Geoffrey Nevill, in 'Journ. Conchyliologie,' xxvi. 1878, p. 59, shows that *semifusca* is from the Mauritius, not from Pondichéry.

Locality. Mauritius (*E. Dupont*).

The example in the British Museum of *H. rufa*, Lesson, Mauritius ('Voyage "Rattlesnake,"' 1847), is the same as a shell sent to me by Mr. Ponsonby. There is a single specimen of *H. scalpta* from Sir David Barclay, Isle of France; it is named on the original label *H. rufa*, and has the same

pitted sculpture of the shell, in Mr. Ponsonby's collection, but has strong rough lines of growth in addition.

The animal has no shell-lobes and therefore it cannot be mistaken for a *Macrochlamys*. The left dorsal lobe is in two parts, the smaller posterior well separated from the larger anterior. The visceral sac is closely mottled with black, with a tendency to form bands of that colour crossing it transversely. Towards the apical whorls black predominates, speckled with white. The branchial chamber is very ample and long. This description is taken from a specimen collected in the forests by Dupont.

The genitalia (fig. C) are of the same type as in the preceding species, with the same lengthened twisted flagellum. The spermatheca differs in being more ample and bulbous at the free end. There is also a peculiar dark pigmented globose expansion in the free oviduct, just below the point where the vas deferens is given off, which may be an ovitheca. The generative organs agree well with Semper's figure of a Bourbon specimen.

The radula, like that of the preceding species, has a great number both of admedian and minute marginal teeth; these and the larger marginals being bicuspid, inner cusp the longest. The formula is: 58 . 2 . 19 . 1 . 19 . 2 . 58, or 79 . 1 . 79. The jaw is solid, cutting-edge concave with central projection.

Subgenus DUPONTIA, nov.

Type *E. perlucida*.

Shell umbilicated, very depressedly conoid, thin, glassy to the eye. Animal with a mucous gland overhung by a well-developed lobe. Foot divided.

The penis has a very long flagellum and an accessory organ in the shape of a small sac attached to the penis-sheath towards its distal end. Spermatheca long. Radula with about 100 teeth in the row: *the central and admedian teeth short and blunt with no side cusps*; the laterals evenly bicuspid.

The generative organs, radula, and shell differ from those of *Erebia rufozonata* &c.—the first, although of the same type, by the presence of the peculiar accessory gland; the second in the form of the central and admedian teeth without cusps.

A comparison with the African genus *Martensia* is interesting, because the genitalia are of the same type, as regards an accessory gland being also present (*vide Proc. Malacological Soc.* vol. i. pt. 6, July 1895, p. 282, pl. xix. fig. 1 d); the radula and shell, however, are quite different.

Erepta (Dupontia) perlucida, H. Adams.
(Pl. X. fig. 5, shell; Pl. XI. figs. 1-1 d, animal.)

Macroohlamys in nomenclature.

Locality. Mauritius (*E. Dupont*).

Shell very depressedly globose, of thin texture, umbilicated, base flat; sculpture quite smooth, glassy to the eye, except on the apical whorls, where longitudinal striation is very well seen; colour pale greenish ochre; spire very low, sides flat, apex rounded; suture very shallow; whorls 5, regularly increasing, very flattened, the last rounded on the periphery; aperture lunate, oblique; peristome very thin, columellar margin, oblique, not reflected and only slightly thickened.

Size: major diam. 9.25, alt. axis 3.5 mm.

Animal black; the wall of the branchial cavity is mottled black and white, the former predominating. The foot is divided and has a broad peripodial margin marked with black, and the sides of the foot are mottled with grey. The left shell-lobe is narrow and long, widest in the middle part, tapering away on both sides. The left dorsal lobe is in two distinct parts, contiguous to each other. The visceral sac is brown on the apical whorls.

The teeth of the radula are like those of *levis*. Formula:

39 . 1 . 8 . 1 . 8 . 1 . 39, or 48 . 1 . 48

The central and admedians have broad squarish plates, the teeth broad and blunt with no side cusps, narrowing, but still bluntly rounded, up to the 11th and 12th transition teeth. On the 18th tooth a small notch occurs very low down on the outside; this notch rises gradually upwards to the 19th tooth and thence to the margin all are evenly bicuspid. Jaw with a concave cutting-edge, centre part nearly straight.

Generative organs. No amatorial organ. The penis, commencing at the generative aperture, is cylindrical and elongate to where a small accessory sac is given off, the portion next above this tapers gradually to the retractor muscle; the epiphallus is short and is the seat of the spermatophore up to where the vas deferens unites with the penis, there is at this point a long thin flagellum. The spermatheca is a long narrow tube, terminating probably in a bulb; just above its junction with the free oviduct there is a large globose swelling in this duct, which narrows suddenly again towards the oviduct and where the vas deferens commences.

Erepta (Dupontia) levis, sp. n. (Pl. IX. figs. E-E 4.)

Locality. Mauritius (*E. Dupont*).

Shell (fig. E) very depressedly globose, narrowly umbilicated, shiny, base flat; colour pale sap-green; sculpture, microscopic longitudinal striation on the three first whorls, becoming smooth and indistinct on the remaining; spire very low; apex flatly rounded; suture slightly impressed; whorls 4 (? adult), regularly increasing, flatly convex; aperture lunate, oblique; peristome thin, columellar margin weak, not reflected, oblique.

Size: major diam. 7.25, alt. axis 2.75 mm.

This species differs from the preceding, to which it is very closely allied, in the less shallow suture and less flattened whorls.

The following probably belong to this subgenus: *virginea*, Morelet, has rough longitudinal sculpture, indistinctly decussate; *nitella*, Morelet, is quite smooth and glassy, more closely umbilicated and more closely wound than *levis*; *poweri*, H. Adams—*levis* is nearest to this, but in *poweri* the whorls are broader, flatter, and more openly wound.

The animal as seen through the shell is dark-coloured, finely mottled with white. The extremity of the foot (fig. E 1) has an overhanging lobe; the peripodial grooves are well marked, with the fringe-like edge below wide, and streaked with black. There are no shell-lobes, and the dorsal lobes are simple (fig. E 2).

In the generative organs (fig. E 3) a short thick retractor muscle is attached to the head of the penis-sheath; the epiphallus is short; the flagellum is long, slightly expanding towards the free end. The spermatheca is long and narrow, not bulbous. The radula formula is 26 . 4 . 8 . 1 . 8 . 4 . 26, or 38 . 1 . 38. The centre tooth and admedians are plain solid teeth with no side cusps and blunted points. On the 9th, 10th, 11th, and 12th a tooth on the outer side appears and rises towards the main tooth, the laterals becoming evenly bicuspid (fig. E 4).

The jaw is nearly straight in front, with a slight central projection.

Erepta (Ctenophila) caldwelli, Benson (Barclay MSS.).
(Pl. XI. fig. 2.)

Helix caldwelli, Bs. A. M. N. H., Feb. 1859, p. 98; Mon. Hel.; Ancey (*Ctenophila*), Le Naturaliste, vol. ii. p. 69, Jan. 1882;

Nevill, *Nanina* (*Erepta*?), Hand-list, i. p. 44 (= *H. paulus*, Morelet).

Erepta and *Patula* sp., in nomencl.

Helix vinsoni, Desh.

Helix setiliris, Bs.

Locality. Pouce Mountain, Mauritius (*E. Dupont*).

Animal black and white in the spirit-specimen, the white confined to the sole and margin of the foot below the peripodial grooves, and to the head and neck ; the black on the head extends from the eye-tentacles along the upper side of the neck, with a narrow white line separating the two. The visceral sac is pale ochraceous, finely dotted with black, the dots closest next the mantle-edge.

Dorsal lobes small, the right black, the left in two parts, distant from each other ; the anterior speckled, the posterior very small. Foot very distinctly divided. Lobe over mucous pore very small.

Genitalia. The male organ has at the junction of the vas deferens a long flagellum. The epiphallus is short. From the retractor muscle attachment the shaft is a long narrow tube, swelling near the generative orifice. Situated here, and seen by transmitted light, is what appears to be a small cæcum, the free end pointing towards the aperture. The spermatheca is a very long strong tube ending in a thin-walled bulbous sac. This contained a spermatophore in a perfect state of the simplest construction, consisting of an extremely long whip-like flume terminating in an elongate capsule ; the flume has no spines, but at one part the edge is serrated. This is very interesting, and can be compared with the figure of this organ by Prof. C. Semper, pl. iii. fig. 24, of his *Rotula rufa*, from Bourbon.

Erepta odontina, Morelet. (Pl. XI. fig. 3.)

Rev. et Mag. (1851).

= *Helix suffulta*, Ba. A. M. N. H. ser. 2, xi. p. 34 (1853) ; Novill, *Nanina* (*Erepta*), Hand-list, i. p. 44 (1878).

Helix lightfooti, Pfr. P. Z. S. 1851, p. 150. Australia ?

Locality. Pouce Mountain, Mauritius (*E. Dupont*).

Animal colourless in spirit, only the eye-muscle showing black, and some black speckling on the mantle where reflected over the edge of the peristome. Foot divided. Mucous pore with a lobe above it. Peripodial grooves distinct. The generative organs (fig. 3) are quite of the type of *Dupontia perlucida*. The penis-sheath is clongate, cylindrical, with a blunt protuberance on the side, continuing as a diminished tube to the retractor muscle. The epiphallus is short and at the junction of the vas deferens there is a very long thin flagellum. The spermatheca is a very strong, thickened, long tube, with a thin bulbous termination ; it contained a perfect spermatophore. An elongate capsule

was attached to a very long, finely pointed, and narrow flume quite simple and spineless.

Radula: form of teeth as in *E. leucostyla*; formula:

25 . 1 . 10 . 1 . 10 . 1 . 25, or 36 . 1 . 36.

Jaw slightly curved, with a central projection.

The internal anatomy of these eight species shows a most interesting similarity of type, while their shells differ in a remarkable way. We have them with large solid shells of turbinate or depressedly turbinate shape, some small, thin, smooth, and depressedly globose, others orbiculately depressed, with strong ribbing; this assemblage has consequently been placed in different genera from the conchologist's point of view, which need not be altered. Long isolation on oceanic islands of small area, under conditions only varying with altitude, has evidently led to the greatest variation taking place in one direction only, viz. the shell. Association with all other genera being cut off, changes in the animal could only be specific and slight.

I consider this Mascarene group of land-mollusca is well worthy of subfamily distinction, for which I propose the name "Ereptinæ." Similar anatomical detail has not been met with by me in any of the Indian genera, nor as yet in any South African I have examined. The distinction bears out the extremely isolated position of these islands and their great antiquity—islands where such a family as the Dididæ was developed; where so many rare and now extinct genera lived, such as the flightless rails *Aphanapteryx* of Mauritius and *Erythromachus* of Rodriguez, with *Lophopsittacus* (a large parrot) and a *Nycticorax* (a night heron) respectively; where the reptilia and plants all point to extremely long isolation following on a once far more extended range and connection with lands of distant geological age.

Subfamily *EREPTINÆ*.

Shells of very varied form; animal with no shell-lobes. Foot divided, with mucous pore, peripodial grooves, and border. Genitalia: no amatorial organ; penis with lengthened flagellum and long spermatheca; the spermatoaphore without spines; a capsule attached to a long tapering flume. Radula and jaw as in the family Zonitidæ.

In a consignment of Mauritian shells collected by Monsieur E. Dupont and sent to me by Mr. John Ponsonby

are two minute species under the names of *Microcystis barclayi* and *M. perlucida*: the former I first compared with three examples in the Natural History Museum; these were originally in Henry Adams's collection and we may therefore consider them typical. I was afterwards able to see the typical specimens in the Benson collection at Cambridge, through the kindness of Prof. S. F. Harmer. There are many examples of *barclayi*, Bs., all from the Mauritius—about nine are labelled *Trochomorpha*, two *Erepta*, one no genus. Most of them are not fully grown and many are imperfect, particularly at the peristome—no doubt due to the method adopted by McAndrew of sticking the shells on cards, which lie among other cards. None of the specimens come up to the size recorded by Benson, viz. 4 mm., the largest being 3.25 mm. The sculpture of *barclayi* consists of irregular fine close ribbing, showing stronger in some specimens than in others and extending to the protoconch. I give figures of one of the Cambridge Museum shells (Pl. X. figs. 1-1 b), as I do not think the species has ever been figured before; its principal character is the subangulate periphery: this specimen was 3 mm. in major diameter. It is difficult to understand why Von Martens, in the 1860 edition of 'Die Heliceen,' included a small shell like *barclayi* in *Erepta*—a genus Albers created in 1850—with type *stylodon*, Pfr., a large solid shell. The sculpture of the other shell found by M. Dupont is quite different from *barclayi* and from all the other minute helices in the B.M. collection examined by Mr. Edgar Smith and myself.

As *barclayi* cannot be retained in the genus *Erepta*, I place it with other similar small shells from these islands in a new genus (*Louisia*) of the Zoniidæ (see Pl. X. figs. 1-1 b).

Genus LOUISIA.

Shell small, subpyramidal or globose, last whorl keeled or rounded on the periphery, with regular transverse distant fine ribbing. Animal with a mucous gland and peripodial groove. Ovoviviparous in habit. The radula with about 70 teeth in a row; central teeth on broad plates, few in number, all tricuspid; marginals also tricuspid. Jaw oxygnathous.

Louisia insularis, sp. n. (Pl. X. figs. 2-2 c, Type.)

Locality. Mauritius (E. Dupont).

Shell depressedly globose; sculpture fine somewhat regular ribbing, which on the last whorl extends to the periphery and basal side; first whorl smooth; colour ochraceous; spire low, apex blunt; suture well impressed;

whorls $4\frac{1}{2}$, rounded on the periphery, convex above; aperture narrowly lunate; peristome thin, columellar margin sub-oblique.

Size: major diam. 3, alt. axis 1·4 mm.

This shell is not nearly so keeled as that of *L. barclayi*, although having fewer whorls and being much smaller.

The animal is very small, yet the specimens are so well preserved, a good deal of its form could be made out. It is pale throughout, the eye-tentacles being the only dark parts; these rise rather far back on the neck and are club-shaped (fig. 2 a). The foot is divided and there is a mucous pore with a small process above it more or less pointed (fig. 2 c). The mantle-edge overlaps the edge of the peristome (fig. 2 a). The right dorsal lobe is triangular, the left longer and narrower. The animal is ovoviparous (fig. 2 b), with often four immature shells in the oviduct, the two most mature showing the ribbing of the shell. I could not make out the rest of the genitalia.

The jaw (fig. 2 d) has a very small central projection. The teeth of the radula (fig. 2 e) have the formula 30 . 4 . 1 . 4 . 30, or 34 . 1 . 34. The central tooth and the four admedian teeth are on very broad quadrate plates, square above, all tricuspid, the side cusps rather low down; there is a single intermediate tooth with a single cusp on the outside, succeeded by an evenly bicuspid series; at the 18th tooth the laterals become tricuspid.

In several important characters of its anatomy this species is similar to *Philonesia* of Sykes, described by me in 'Fauna Hawaiiensis,' vol. ii. 1900 (Mollusca). The teeth of the radula are of the same type, with the exception that the admedian teeth are tricuspid in the Mauritian species, but have a single cusp on the outside in *Philonesia baldwini*, Ancey.

Louisia duponti, G.-A. (Pl. X. figs. 3-3 c.)

Locality. Island of Fourneaux, S.W. of Mauritius (*Dupont*), 15. v. 07.

Shell globosely turbinate, last whorl rounded below; sculpture regular, distant, engraved spiral striation on lower side and all the whorls crossed by fine lines of growth; colour pale chestnut; spire conic, sides flat, apex rounded; suture impressed; whorls 4, regularly increasing, convex; aperture semilunate, oblique; peristome very thin, columellar margin scarcely thickened, not reflected, oblique.

Size: major diam. 2·5, alt. axis 1·4 mm.

Animal (Pl. X. fig. 3 b) ovoviparous; one shell contained three immature ones. Sole of foot narrow elongate, with a peripodial margin, probably a mucous gland. It is somewhat similar in its form to *L. insularis*, but I failed to see the mucous gland; it no doubt possesses that organ, the radula and eye-tentacles being of similar type.

The radula (fig. 3 c) has the formula 25 . 8 . 1 . 8 . 25, or 33 . 1 . 33.

The central tooth and admedians are similar on broad plates, with a long central point rising well above basal cusps on either side; the transition-teeth have one outside cusp, and the laterals are curved and tricuspid. The jaw (fig. 3 c) is high, rounded above, and with a central projection on the cutting-edge, which is slightly concave.

Kaliella fourneauensis, sp. n. (Pl. X. figs. 4, 4 a.)

Locality. Island of Fourneau, S.W. of Mauritius (*Dupont*), 15. v. 07.

Shell (fig. 4) pyramidal, very narrowly perforate; sculpture irregular transverse striation, finer and more regular on the apical whorls; colour pale ashy; spire nearly as high as diameter of base; suture shallow, marked by a fine lirate line; whorls 6, slightly convex, the last carinate and lirate; aperture semicircular; peristome thin, columellar margin slightly reflected.

Size: major diam. 3·25, alt. axis 3·0 mm. Largest example.

The formula of radula (fig. 4 a) is 25 . 7 . 1 . 7 . 25, or 32 . 1 . 32. The central and admedian teeth are alike, on broad plates, tricuspid, basal cusps on both sides of the main point; the marginal teeth also tricuspid, but more evenly so.

EXPLANATION OF THE PLATES.

PLATE IX.

- Fig. A.* *Erepta leucostyla*, genitalia, part of, $\times 2\cdot25$.
- Fig. A 1.* Ditto, jaw, $\times 0\cdot25$, and teeth of the radula, $\times 277$.
- Fig. B.* *Erepta rufozonata*, part of genitalia, $\times 2\cdot25$.
- Fig. C.* *Erepta (Cielatura) rufa*, part of genitalia, $\times 2\cdot25$.
- Figs. D, D.* *Erepta (Cielatura) cielatura*, part of genitalia, $\times 2\cdot25$.
(The male organ in upper figure is shown detached.)
- Fig. E.* *Erepta (Dupontia) lens*, sp. n., shell, $\times 3\cdot4$.
- Fig. E 1.* Ditto, extremity of foot, with mantle-edge and part of the visceral sac, $\times 6$.
- Fig. E 2.* Ditto, right and left dorsal lobes, $\times 6$.
- Fig. E 3.* Ditto, genitalia, part of, $\times 6$.
- Fig. E 4.* Ditto, jaw, $\times 22\cdot5$; teeth of radula, $\times 277$.

PLATE X.

Fig. 1. *Louisia barclayi*, Bs., typical specimen from the Benson collection, Cambridge, $\times 5$.

Fig. 1 a. Ditto, apical whorls, $\times 58$.

Fig. 1 b. Ditto, sculpture on the last whorl, $\times 58$.

Fig. 2. *Louisia insularis*, sp. n., shell, $\times 8$.

Fig. 2 a. Ditto, animal from right side, $\times 9$.

Fig. 2 b. Ditto, showing sole of foot with shell, and young shells within it, $\times 9$.

Fig. 2 c. Ditto, extremity of foot, with mucous pore, $\times 9$.

Fig. 2 d. Ditto, jaw, $\times 48$.

Fig. 2 e. Ditto, teeth of radula, $\times 300$.

Fig. 3. *Louisia duponti*, sp. n., shell, $\times 12$.

Fig. 3 a. Ditto, sculpture on last whorl, $\times 58$.

Fig. 3 b. Ditto, shell with animal, one showing the immature shells in the oviduct, $\times 6$.

Fig. 3 c. Ditto, jaw, $\times 48$; teeth of radula, $\times 300$.

Fig. 4. *Kaliella fourneauauxensis*, sp. n., $\times 8$.

Fig. 4 a. Ditto, teeth of the radula, $\times 300$.

Fig. 5. *Erepta (Dupontia) perlucida*, shell, $\times 3\cdot4$.

PLATE XI.

Fig. 1. *Erepta (Dupontia) perlucida*, mantle-zone, left side, showing shell- and dorsal lobes, $\times 6\cdot2$.

Fig. 1 a. Ditto, extremity of foot, $\times 4$.

Fig. 1 b. Ditto, jaw, $\times 15$.

Fig. 1 c. Ditto, teeth of the radula, $\times 184$.

Fig. 1 d. Ditto, genitalia, $\times 4$.

Fig. 2. *Erepta (Ctenophila) caldwelli*, genitalia, $\times 6$.

Fig. 3. *Erepta odontina*, genitalia, $\times 4$.

ant.l.d.l., anterior left dorsal lobe; *post.l.d.l.*, posterior left dorsal lobe; *r.d.l.*, right dorsal lobe; *ep.*, epiphallus; *f.*, flagellum; *gen.ap.*, generative aperture; *ov.*, oviduct; *p.*, penis; *pr.*, prostate; *sp.*, spermatheca; *sper.*, spermatophore; *v.d.*, vas deferens; *v.s.*, visceral sac; *r.m.p.*, retractor muscle of penis.

LI.—*Descriptions of some Rhynchota from Ruwenzori.*
By W. L. DISTANT.

THESE descriptions refer to the collections made by the recent British Museum Expedition to Ruwenzori in Central Africa. The full enumeration of the species will subsequently appear in the 'Transactions of the Zoological Society of London.' I have previously described in these pages some new species collected by Mr. Scott Elliot during his journey to the same locality. The types are in the British Museum.

HETEROPTERA.

Fam. Pentatomidae.

Genus CAURA.

Caura, Stål, Hem. Afr. i. p. 168 (1864).

Caura leggei, sp. n.

Head, pronotum, and scutellum metallic bluish green; corium opaque olivaceous green; membrane dark bronzy green; connexivum indigo-blue; head beneath pale sanguineous, the lateral margins before antennæ bluish black; sternum metallic bluish green, a longitudinal fascia running between the coxae pale sanguineous; abdomen beneath sanguineous, with a central longitudinal series of five large spots, four on each lateral area, four on each lateral margin, the extreme lateral margin, a small transverse spot on each side of apical segment, and the legs bluish black; antennæ black, the basal joint (excluding extreme apex) sanguineous, first joint not reaching apex of head, second and third subequal in length, shorter than fourth and fifth, which are also subequal, fourth distinctly dilated; rostrum with the first joint sanguineous and reaching base of head, remaining joints black, second joint about reaching the intermediate coxae, third joint short, just passing the intermediate coxae, apical joint slightly passing the posterior coxae; head, pronotum, and scutellum thickly punctate and slightly rugulose; corium very finely and indistinctly punctate, more prominently so on claval and costal areas; connexivum thickly finely granulose.

Long. 12 mm.; exp. pronot. angl. 8 mm.

Semiliki Forest.

Var.—Above somewhat paler green; basal joint of antennæ black, concolorous; head beneath blackish, its base ochraceous, all the sanguineous coloration beneath replaced by ochraceous.

Hab. East Africa; Masaba (Coll. Dist.).

Carbula bicolor, sp. n.

Head, pronotum, scutellum, and corium fuscous brown; anterior lateral margins of pronotum, basal lateral margins of corium, and a somewhat large spot near each basal angle of scutellum pale, levigate, shining ochraceous; membrane bronzy brown, with the veins darker; connexivum brownish

ochraceous, its inner margin and the posterior segmental margins black; body beneath and legs ochraceous, abdomen with a waved castaneous line on each lateral area; antennæ with the first joint fuscous brown, remaining joints pale ochraceous, basal joint not quite reaching apex of head, second, third, and fourth joints almost subequal in length, fifth a little the longest; rostrum just passing the posterior coxæ, first joint reaching base of head, second reaching the intermediate coxæ and about as long as third and fourth together; head longer than broad, thickly coarsely punctate, the apex of the central lobe a little prominent; pronotum broader than long, thickly coarsely punctate, the posterior angles strongly, robustly, horizontally produced, their apices subacute and very slightly recurved, a little notched behind; scutellum coarsely punctate and wrinkled, shorter than the corium, the basal angular pale spots subglobose; corium more finely punctate; membrane reaching the apex of abdomen.

Long. 9 mm.; exp. pronot. angl. 7 mm.

Old Camp, 6000-7000 feet.

AWEMBA, gen. nov.

Somewhat flatly broad and subovate; head narrowing anteriorly, the lateral lobes distinctly longer than the central lobe, their apices somewhat widely separated; antennæ five-jointed, basal joint not quite reaching apex of head, second and fourth subequal in length, fifth longest; rostrum reaching the posterior coxæ, first joint reaching base of head, second longest and not quite reaching intermediate coxæ, third and fourth joints short and subequal in length; pronotum much broader than long, the lateral angles strongly, robustly, spinously produced, the anterior lateral margins coarsely serrate, posterior margin truncate before scutellum, lateral margins concavely sinuate, anterior margin excavated for the reception of the head; scutellum about as long as broad at base, its lateral margins oblique to near middle and then more suddenly narrowed, its apex rounded; corium longer than scutellum, not covering connexivum, which is widely exposed; membrane somewhat short, about reaching abdominal apex; abdomen beneath convex, apical angles of sixth abdominal segment acuminate; legs simple, not spined.

This genus in general appearance and character is allied to *Carbula*, Stål, but widely diverges by the lateral lobes of the head being longer than the central and by the serrate lateral margins of the pronotum.

Awemba typica, sp. n.

Pale luteous and more or less thickly punctate, the punctures black towards base of head, sparsely scattered near anterior margin of pronotum, forming a distinct broad basal fascia between the lateral pronotal angles, sparsely distributed over the corium and thick and close at apex of scutellum; antennæ with the fourth and fifth joints darker or more castaneous; pronotum very coarsely punctate, the lateral angles robustly spinously produced; scutellum coarsely wrinkled and punctate; corium somewhat opaque and finely sparsely punctate; abdomen beneath with the spiracles black, sometimes with the lateral margins (broadly) and a central longitudinal fascia (narrowly) darker; other structural characters as in generic diagnosis.

Long. 8½-9 mm.; exp. pronot. angl. 7 mm.

Ruwenzori, 5600 ft. (Scott Elliot); E. Ruwenzori.

Awemba fusca, sp. n.

Dark fuscous brown, apical area of head and the produced pronotal angles more piceous; antennæ, lateral crenulate margins of pronotum, and a large globose spot near each basal angle of scutellum ochraceous; membrane fuscous grey, the veins darker; connexivum dull ochraceous, inwardly black; body beneath paler than above and darkly punctate; legs dull ochraceous; head thickly coarsely punctate, apices of the lateral lobes outwardly rounded and widely separated in front of central lobe; antennæ with the second and fourth joints subequal in length, first joint not reaching apex of head, fifth joint mutilated in type; pronotum coarsely punctate and granulose, the lateral angles robustly, spinously, horizontally produced; scutellum wrinkled and punctate; corium somewhat opaque and more sparingly punctate; rostrum with the first joint reaching base of head, second longest and not quite reaching intermediate coxae, third and fourth shortest and subequal, the fourth slightly passing the posterior coxae.

Long. 7 mm.; exp. pronot. angl. 6 mm.

Old Camp, 6000-7000 feet.

Genus ASPONGOPUS.

Aspongopus, Lap. (part.) Ess. Hém. p. 58 (1832).

Aspongopus alternatus, sp. n.

Body above, antennæ, rostrum, head beneath, sternum, and

legs black; connexivum, abdomen beneath, and the femora luteous; anal abdominal segment black; head with the lateral lobes foliaceous and produced in front of the central lobe, their apices divided; antennæ with the basal joint shortest, second a little shorter than third, fourth and fifth longest and about subequal in length; rostrum passing the anterior but not quite reaching the intermediate coxae, first joint slightly extending beyond base of head, second a little longer than third and fourth together; pronotum, scutellum, and corium rugose, the first more finely so and coarsely punctate, the second transversely rugose and coarsely sparingly punctate, the corium more irregularly rugose and sparingly coarsely punctate; membrane more piceous than black; tibiae sulcate; tarsi ochraceously pilose.

Long. $13\frac{1}{2}$ - $14\frac{1}{2}$ mm.

E. Ruwenzori, 6000-13,000 feet, and Old Camp, 6000-7000 feet.

Allied to *A. nigroviolaceus*, Pal. Beauv., but differing in having the second joint of the antennæ shorter than the third and in the colour of the under surface of the abdomen &c.

Fam. Coreidæ.

Genus HOLOPTERNA.

Holopterna, Stål, En. Hem. iii. p. 41 (1873).

Holopterna wollastoni, sp. n.

Head and scutellum black; pronotum and corium piceous black, the latter with a large ochraceous basal spot; antennæ piceous black, the apical joint pale ochraceous, with its extreme base blackish; membrane dark bronzy; connexivum black and more or less ochraceously spotted at the segmental incisures; body beneath and legs black; antennæ with the basal joint about as long as pronotum, longer than second joint, second, third, and fourth joints almost subequal in length; rostrum reaching the intermediate coxae, first joint slightly passing base of head, second extending between the anterior coxae, third shortest, just passing the anterior coxae; head excavated between the apices of the lateral lobes; pronotum much shorter than breadth between the lateral angles, which are strongly produced moderately upwardly and apically slightly recurved, the lateral margins of the produced angles crenulate; corium somewhat finely punctate; posterior tibiae in ♂ spined beneath near apex, posterior femora

in ♂ a little curved; second ventral segment distinctly tuberculous on each lateral area in ♂, in ♀ less prominently so.

Long., ♂ 22 mm., ♀ 24–27 mm.

Old Camp, 6000–7000 feet, and 6000–13,000 feet.

Holopterna affinis, sp. n.

Head, pronotum, and scutellum black; corium piceous; membrane dark bronzy; body beneath and legs black; tarsi piceous brown; antennæ ochraceous, the whole of the first joint (excluding extreme apex), a broad subcentral annulation to second joint, and a similar annulation to third joint, which, however, extends nearer apex, black, first joint a little longer than pronotum and only slightly longer than second joint, third shortest, fourth about subequal to first; rostrum about reaching the intermediate coxae, first joint almost reaching base of head, second reaching anterior coxae, third shortest and just passing anterior coxae, fourth almost reaching the intermediate coxae; pronotum rugulose, the lateral angles produced upwardly and forwardly, strongly dentate on each edge, their apices acute; second and third ventral segments in ♂ longly tuberculate on each lateral area; posterior tibiae in ♂ flattened and dilated and spined beneath near apex, posterior femora incrassate, moderately curved, finely crenulate beneath.

Long., ♂ 22 mm.; exp. pronot. angl. 10 mm.

Mububi River, S.E. Ruwenzori.

Allied to *H. valga*, Linn., and *H. alata*, Westw., but separated from both by the longly, acutely, and anteriorly produced pronotal angles.

Genus MYGDONIA.

Mygdonia, Stål, Hem. Afr. ii. pp. 2 & 16 (1865).

Mygdonia montana, sp. n.

♂ ♀. Piceous brown; corium shortly, palely, sparingly pilose; extremo apex of scutellum ochraceous; membrane dark bronzy; antennæ pale castaneous, first and fourth joints subequal in length, second slightly shorter than first, longer than third; rostrum reaching the intermediate coxae, first joint extending to base of head, second a little longer than third, which just passes the anterior coxae; pronotum coarsely granulose, the lateral angles moderately, roundly, a little upwardly produced, their margins coarsely crenulate, anterior

lateral margins also crenulate or dentate; scutellum transversely wrinkled; corium finely and indistinctly punctate; posterior femora strongly incrassate in ♂, shortly, centrally, tuberculously produced beneath and shortly spined beneath at apex, in ♀ only moderately thickened and spined beneath at apex; posterior tibiae in ♂ moderately dilated but not toothed.

Long., ♂ 16, ♀ 20 mm.; exp. pronot. angl., ♂ 6, ♀ $7\frac{1}{2}$ mm.

E. Ruwenzori.

Allied to *M. antinorii*, Leth., but with the pronotal angles much less developed, and more laterally and less anteriorly produced, their apices also more rounded and obtuse.

Genus ACANTHOMIA.

Acanthomia, Stål, En. Hem. iii. p. 82 (1873).

Acanthomia insignis, sp. n.

Head, pronotum, and scutellum piceous; head with two central greyish lines commencing somewhat near together at base and extending to the bases of the antennæ, a similar line on each lateral margin passing inner margins of eyes; basal joint of antennæ castaneous, about as long as pronotum, much longer than second joint, which is ochraceous, remaining joints mutilated in type; pronotum somewhat greyishly piceous, with three discal longitudinal greyish lines, finely greyishly pilose, and with a few scattered very profound dark punctures, lateral angles horizontally spinously produced, their apices slender and smooth, shining black, at about middle of anterior lateral margins a shorter suberect black spine; scutellum moderately raised, with a central greyish line; corium ochraceous, two longitudinal series of black punctures in clavus, a black line before clavus which is apically deflected to apical margin, and a submarginal black line which does not reach base; membrane greyish, with the veins piceous; connexivum piceous, the marginal spines black and posteriorly directed; body beneath and legs chocolate-brown, the tibiae and tarsi ochraceous, bases of tibiae black; rostrum with the basal joint just passing eyes, second joint reaching the anterior coxae and about equal in length to fourth joint, third a little shorter than first; prosternum palely pilose and coarsely punctate; abdomen with oblique greyish lines on each lateral area.

Long. 9 mm.

Ruwenzori, 5000–6000 feet (*Scott Elliot*).
A strikingly marked species, described from a single and somewhat imperfect specimen.

HOMOPTERA.

Fam. Cercopidæ.

Genus PTYELUS.

Ptyelus, St. Farg. & Serv. Enc. Méth. x. p. 608 (1825).

Ptyelus niveus, sp. n.

Body and legs creamy ochraceous; pronotum, scutellum, and abdomen above more or less suffused with stramineous; basal antenniferous tubercle, a longitudinal spot near bases of anterior tibiæ, anterior and intermediate tarsi, the apical fringe of the posterior tibiæ, and the claws of the posterior tarsi black, base of the apical joint of intermediate tarsi creamy ochraceous; tegmina silvery white, opaque, base of costal margin and a short central discal longitudinal line black, the reticulate veins at the apical area piceous; vertex centrally half as long as breadth between eyes, a distinct impression enclosing a small lunate space a little before apex; face a little centrally longitudinally flattened, laterally transversely striato; pronotum anteriorly convexly rounded, posteriorly strongly concavely excavate before scutellum, which is longer than broad; posterior tibiae with two spines, the one nearer base shortest and somewhat indistinct.

Long., excl. tegm., 11 mm.; exp. tegm. 30 mm.

E. Ruwenzori, 6000–13,000 feet.

Genus LEPYRONIA.

Lepyronia, Amy. & Serv. Hém. p. 567 (1843).

Lepyronia aethiops, sp. n.

Pale stramineous; two central longitudinal fasciæ extending through head, pronotum, and scutellum, in the latter occupying the lateral angles, lateral margins of head (not reaching apex), lateral margins of pronotum, basal and inner margins of clavus, basal costal margin of tegmina, a costal spot behind middle, two oblique inner fasciæ on apical area, a spot on each basal side of head beneath between the face and eyes, a spot on each side of base of clypeus, a longitudinal fascia on each side of sternum, and the abdomen

beneath black; legs ochraceous; head shorter than pronotum, ocelli a little less removed from each other than from eyes; tegmina distinctly thickly punctate; posterior tibiae with two strong spines.

Long. 6 mm.

E. Ruwenzori, 6000–13,000 feet.

LII.—*A Synopsis of the Fishes of the Subfamily Salanginæ.*
By C. TATE REGAN, M.A.

SALANGINÆ.—Argentinidæ with the dorsal fin placed far behind the pelvics, the head depressed, flat above, and the body elongate, subcylindrical anteriorly and compressed posteriorly. Teeth conical; scales deciduous; 4 branchiostegals; pelvic fins 7-rayed *.

Synopsis of the Genera.

- I. Premaxillaries subnormal; lower jaw projecting.
 - A. Dorsal fin entirely in advance of the anal; tongue with 2 series of teeth; 2 series of teeth on each side of the palate; teeth in the jaws small, subequal 1. *Protosalanx*, gen. nov.
 - B. Dorsal fin partly above the anal; tongue toothless; 1 series of teeth on each side of the palate.
Teeth in the jaws small, subequal 2. *Salangichthys*, Bleek.
A pair of canines near the symphysis of the lower jaw; premaxillary teeth somewhat enlarged, strongly recurved 3. *Hemisalanx*, gen. nov.
- II. Premaxillaries forming an anterior triangular expansion; lower jaw not projecting; a single series of teeth on each side of the palate; 1 or more anterior canines in the lower jaw, perforating the roof of the mouth behind the premaxillary expansion; premaxillary teeth strong, recurved, set rather far apart.
 - A. Dorsal fin entirely in advance of the anal; tongue with a single series of teeth; lower jaw ending in a short fleshy appendage. 4. *Leucosoma*, Gray.
B. Dorsal fin wholly or partly above the anal; tongue toothless.
Lower jaw ending in a short fleshy appendage 5. *Salanx*, Cuv.
Lower jaw ending in a distinct, more or less movable presymphyseal bone, with a double series of teeth 6. *Parasalanx*, gen. nov.

* In *Protosalanx*, *Salangichthys*, *Hemisalanx*, and *Parasalanx*, and probably throughout the group, the males have the outer pectoral ray produced and the anal fin modified, the middle rays being set close together and curved backwards, whilst on each side of the body a single longitudinal series of adherent scales, decreasing in size posteriorly, is placed above the base of the fin.

*Synopsis of the Species.*1. *Protosalanx hyalocranius*, Abbott, 1901 *.

D. 17. A. 30-32. P. 23-25. Depth of body 10-13 in the length (♀), length of head $5\frac{1}{4}$ - $5\frac{1}{2}$.

Three specimens, 115-130 mm. in total length, from Shanghai (Swinhoe).

2. *Salangichthys microdon*, Bleek., 1860.

D. 12-14. A. 25-27. P. 15-16. Origin of anal below posterior rays of dorsal.

Numerous specimens, up to 85 mm. in total length, including the types of the species from Yeddo (Bleeker), and examples from Vladivostock (Hook), Yokohama ('Challenger'), and the Inland Sea of Japan (Gordon Smith).

3. *Hemisalanx prognathus*, sp. n.†

D. 13. A. 26. P. 10. Depth of body 14 in the length, length of head $6\frac{1}{2}$.

A single specimen, 120 mm. in total length, from Shanghai (Swinhoe).

4. *Leucosoma chinense*, Osbeck, 1765 (*Synodus macrocephalus*, Lacep., *Leucosoma reevesii*, Gray).

D. 10-11. A. 29-31. P. 10-12.

Four specimens, 160-180 mm. in total length, from China, including the type of *L. reevesii*.

5. *Salanx ouvieri*, Val., 1849.

D. 13. A. 26-27. P. 9-10. Depth of body 13 to 14 in the length, length of head $5\frac{1}{4}$. Head 3 times as long as broad; snout as long as postorbital part of head. Origin of pelvics nearer to that of anal than to base of pectoral; anal origin below fourth or fifth ray of dorsal.

* Abbott gives D. 16-18. A. 28-31. P. 27 for specimens from Tien-tsin. His figure of a male shows depth of body 9 in the length.

+ *Salanx ariakensis* (Kishinouye), Jord. & Snyder, Proc. U.S. Nat. Mus., 1902, p. 592, from the Ariaka Sea (Kiushiu), is an insufficiently described species which may belong to *Hemisalanx*.

D. 13. A. 26. P. 10. Dorsal opposite anal. Teeth subequal; tongue toothless.

Two specimens, 150 mm. in total length, from Ichang (*Pratt*).

I am indebted to Dr. Pellegrin for notes on the type of the species, which leave little doubt that these examples should be referred to *Salanx cuvieri*.

6. *Parasalanx gracillimus*, sp. n.

D. 12. A. 27. P. 10. Depth of body 18 in the length, length of head $5\frac{1}{2}$. Head a little more than 3 times as long as broad; snout as long as postorbital part of head. Origin of pelvics equidistant from head and origin of anal, which is below the eighth or ninth dorsal ray.

A single specimen, 120 mm. in total length, from Shanghai (*Shanghai Museum*).

7. *Parasalanx longianalis*, sp. n.

D. 12-13. A. 30-32. P. 10. Depth of body 13 to 15 in the length, length of head $5\frac{1}{2}$. Head 3 times as long as broad; snout shorter than postorbital part of head. Origin of pelvics equidistant from head and origin of anal, which is below the fifth to the seventh dorsal ray.

Four specimens, 110-125 mm. in total length, from Liao-ho, Northern China (*Morrison*).

8. *Parasalanx acuticeps*, Regan, 1908.

D. 13-14. A. 26-27. P. 9-10. Depth of body 11 in the length, length of head $5\frac{1}{2}$ to $5\frac{2}{3}$. Head 3 times as long as broad; snout shorter than postorbital part of head. Origin of pelvics nearer to anal than to base of pectoral; origin of anal below second dorsal ray.

Two specimens, 115 mm. in total length, from Lake Candidius, Formosa (*Moltrecht*).

9. *Parasalanx angusticeps*, sp. n.

D. 14. A. 28. P. 10. Depth of body 16 in the length, length of head $5\frac{1}{2}$. Head nearly 4 times as long as broad; snout a little longer than postorbital part of head. Origin of pelvics equidistant from base of pectoral and origin of anal, which is below that of the dorsal.

A single specimen, 153 mm. in total length, from China (*Haslar*).

LIII.—*The Systematic Position of Stylophorus caudatus.*
By C. TATE REGAN, M.A.

IN a recent paper (P. Z. S. 1907, p. 634) I proposed the name Allotriognathi for a new suborder of Teleostean Fishes to include the Selenichthyes (Lamprididae), Histichthyes (Veliferidae), and Tæniosomi (Trachypteridae and Lophotidae). Of the Stylophoridae I could only say (p. 643) : "The remarkable *Stylophorus* has usually been placed with or near the Trachypteridae; the single known specimen is not in good enough condition for me to offer any suggestion as to its relationships."

By a remarkable coincidence Dr. E. C. Starks, of Stanford University, was at that time engaged in describing the anatomy of a second example of *Stylophorus caudatus*, captured to the south of the Galapagos Islands at a depth of 300 fathoms*. The results of his researches have just come to hand in the form of an illustrated memoir entitled "The Characters of Atelaxia, a new Suborder of Fishes" (Bull. Mus. Comp. Zool. lvi. 1908, p. 17). This leaves no doubt that *Stylophorus* is a highly specialized Tæniosome, and the definition of the Allotriognathi may be modified in order to include this aberrant form, the Atelaxia ranking with the Selenichthyes, Histichthyes, and Tæniosomi, as a fourth division of the suborder.

The diagnosis of the Allotriognathi, emended in order to include *Stylophorus*, is as follows:—

"Supra-occipital well-developed, separating the parietals; no opisthotic. Maxillaries typically free, protractile, each with an outer blade and an inner posterior process; no supramaxillaries; lower jaw composed of dentary, articulare and angulare. Palatine, if present, without maxillary process. Vertebral column of solid centra which are co-ossified with the arches. Gills pectinate. Pectoral arch attached to the cranium; no mesocoracoid; post-clavicle elongate, of a single piece. Air-bladder without duct. Fins without true spines (except sometimes the first one or two rays of the dorsal); pectoral fin with horizontal or subhorizontal base; pelvic fins, if present, below or a little behind the pectorals, formed of from one to seventeen articulated rays; pelvis, if present, comprising a pair of erect subtriangular bony plates,

* The type in the British Museum was taken between Cuba and Martinique more than 100 years ago.

inserted in the ligament between the coracoids and sometimes directly articulated with them."

Stylophorus agrees with the Tæniosomi and differs from the other Allotriognathi in the following characters:—

"Body elongate. Skeleton feebly ossified; ribs feeble or absent; lower pharyngeals reduced, toothless. No occipital crest. Post-temporal simple; pectoral pterygials plate-like, two or three of them in contact with the coracoid. Fins composed of simple flexible non-articulated rays; dorsal fin very long; anal short or absent *".

Stylophorus differs from the Tæniosomi in several respects, of which the most important are the moderately compressed body, which is eel-shaped rather than ribbon-shaped; the very long lower jaw and backwardly directed suspensorium, correlated with which is the reduction of the pterygo-palatine arcade to a single small pterygoid element and the shifting of the attachment of the branchiostegals from the lower to the upper edge of the cerato-hyal; the cranium more depressed posteriorly, with the epiotics separated by the supraoccipital †, the frontals united by suture throughout their length, the orbito-sphenoid absent and the vomer very small, in position corresponding to the posterior extremity of the vomer in the Tæniosomi; the absence of neural and haemal spines and the fewer vertebrae, 53 in number.

A special resemblance to *Trachypterus* is shown in the structure of the caudal fin, which is divided into a lower portion with horizontal rays and an upper portion with the rays directed upwards.

I take this opportunity of calling attention to an excellent account of the anatomy of *Trachypterus arcticus* by Mr. A. Meek ('Studies Mus. Zool. Dundee,' i. 1890, pp. 55–77, pls. i. & ii.) which I had previously overlooked and which Dr. Starks also does not seem to have known.

Dr. Starks is to be congratulated on having given us so complete and careful an account of the anatomy of this peculiar type, but his method of presenting his results is open to criticism. His diagnosis of the suborder Atelaxia does not give any clue as to its position in the system, and consists almost exclusively of those features which distinguish it from the Tæniosomi, whilst those characters which the two groups have in common are regarded as of minor importance and are

* The anal fin is said to be absent in *Stylophorus*, but Stark's figure shows an anal fin with 12 rays in the middle of the length of the fish; this seems to be an instance of "artistic licence."

† The meeting of the epiotics behind the supraoccipital is often due to the elevation of the posterior part of the cranium.

included in the definition of the family Stylophoridae. Systematic ichthyologists in America emphasize differences rather than resemblances, but this may be carried too far, and I think the important features in the anatomy of *Stylophorus* are those which establish its relationship to the Tæniostomi, whilst its unique characters are of interest only as showing the remarkable specialization which the Tæniosome type is capable of attaining.

LIV.—*Description of a new Species of Charaxes from the Cameroons, West Africa.* By HERBERT DRUCE, F.L.S. &c.

Charaxes acraoides, sp. n.

Male.—Head black, with four yellow spots, two on each side above the eye; antennæ black; collar, tegulae, thorax, and abdomen black; a white spot on the thorax just behind the collar and two yellow spots on each side of the thorax; palpi above black, the underside orange-yellow; the underside of the thorax and abdomen orange-yellow; the legs black. Primaries black, crossed near the apex by a band of four elongated cream-coloured spots, the inner margin streaked with red, above which are five large red spots, the one nearest the anal angle the largest: secondaries red, black at the base and partly along the inner margin, the anal angle and part of the inner margin cream-colour; a black streak at the end of the cell, with the black spots on the underside showing through; the outer margin from the apex to the anal angle black, with a series of minute white dots in the middle of the black margin. Underside: primaries, the apical part of the wing pale yellowish brown, the veins and streaks between the veins black; the cream-coloured band as above, edged on the inner side by a band of black spots which extend along the outer margin to the anal angle; the cell and the central part of wing greenish grey; the usual black marks in the cell; the wing below the cell to the inner margin orange-red: secondaries orange-red, palest above the cell and above the anal angle; the outer margins and veins all black; four large black spots on the costal margin, four in the cell, and a row of five partly round the outside of the cell; the black outer margin is spotted with blue and greenish-grey dots.

Expanse 4½ inches.

Hab. Cameroons, Bitje, Ja River, 2000 feet; wet season (*Mus. Druce*).

This very fine species reminds one at first sight of *Pseudacraea clarki* Butler, which also came in the collection.

LV.—Preliminary Descriptions of Two new Species of
Myonycteris. By KNUD ANDERSEN.

Myonycteris wroughtoni, sp. n.

Diagnosis.— m^2 about twice the bulk of p^1 . Skull and teeth heavy. Forearm about 65–67 mm. *Hab.* Welle District, N.E. Congo.

Differential characters.—Skull larger and more heavily built than in *M. torquata** : total length 34 mm., against 31–31·8 ; rostrum longer and broader : from front of orbit to tip of nasals 10·5–10·7, against 9–9·2, lachrymal width (across lower edges of lachrymal foramina) 9·8–10 mm., against 8·8 ; length of combined orbital cavity and temporal fossa, measured on underside of skull from front of glenoid fossa to back of maxillary process of zygomatic arch, 10·7–11 mm., against 9–9·8 ; frontal region broader : interorbital breadth 6 mm., against 5–5·2. Cheek-teeth on the whole slightly broader ; m^2 less reduced in size, being about twice the bulk of p^1 (in *M. torquata* subequal to p^1), actual length of tooth in two specimens 0·9 mm., against 0·5–0·7 in two *M. torquata*, breadth 0·6–0·7, against 0·4–0·5.—Wings, tibia, and foot conspicuously longer ; forearm 65–67 mm. (57–60·5 in *M. torquata*), third metacarpal 44·5–45 (36–39), lower leg 25–25·5 (22), foot with claws 17–19 (14). Distribution and colour of fur as in the allied species.

Type. ♂ ad. (skin and skull), River Likandi, Welle District, 18th April, 1906 ; Alexander-Gosling Expedition ; B.M. 7. 7. 8. 25. Two specimens examined.

Named in honour of Mr. R. C. Wroughton, who assisted in working out the mammals collected during the Alexander-Gosling Expedition †.

Myonycteris leptodon, sp. n.

Diagnosis.— m^2 about twice the bulk of p^1 . Molariform teeth short and narrow. Forearm about 61–62 mm. *Hab.* Sierra Leone ; Liberia.

Differential characters.—Skull similar to that of *M. wroughtoni*, but rostrum narrower in front (distance between inner bases of canines 3·3 mm., against 3·7–4 in *M. wroughtoni*).

* *Cynonycteris torquata*, Dobson, Cat. Chir. B. M. p. 76, pl. v. fig. 1 (animal) (1878). *C. brachycephala*, Bocage, J. Sci. Muth. Lisboa, (2) i. no. 3, p. 197 (1899).

† Ann. & Mag. Nat. Hist. (7) xix., May and June, 1907.

and *torquata*), coronoid process higher and much slenderer. All molariform teeth conspicuously shorter and narrower than in the two other species of the genus: m^1 , length 1·9 mm., against 2·2, breadth 1·3 mm., against 1·6-1·7; p_4 , length 2·4 mm., against 2·7-3, breadth 1·7 mm., against 1·8; m^2 relatively of the same size as in *M. wroughtoni*, less reduced than in *M. torquata*.—Ears smaller than in the allied species, length from notch 14 mm., against 15-15·5 in *M. torquata* and 16·5-17·5 in *M. wroughtoni*; length of tibia and hind foot as in *M. wroughtoni*, but forearm, metacarpals, and phalanges somewhat shorter. Distribution and colour of fur as in the allied species.

Type. ♂ ad. (skin and skull), Sierra Leone; presented by J. Hickman, Esq.; B.M. 91. 2. 13. 1.—The species is represented in the Leyden Museum from Liberia *.

LVI.—*A new Rodent-Mole from North-western Rhodesia.*
By E. C. CHUBB.

Georychus molyneuxi, sp. n.

Resembling *G. darlingi*, Thos., externally, except for its larger size. Fur very short, not more than 2 or 3 mm. in length. General colour silvery drab, bases of the hairs bluish slate. Crown with a white diamond-shaped patch about 18 mm. long. The area surrounding the mouth in both examples is reddish brown, as is often the case in *G. darlingi*. Skull with nasals converging anteriorly and posteriorly, and extending backward behind the lacrymal projection. Ascending processes of the premaxillaries extending backward about a millimetre behind the nasals. Sagittal and occipital crests well developed. Anteorbital foramen an almost vertical slit, about 2 mm. long.

Dimensions of the cotypes (♂ & ♀):—

Head and body 162, 167 mm.; tail 16, 18; hind foot 24, 26.

Skull of ♀: basal length 35·5; basilar length to henselion 31; greatest breadth 27; nasals 13 × 3·5; interorbital breadth 17; height of anteorbital foramen 2; palate length from henselion 22; diastema 12·5; upper molar series 5·6.

Hab. Loano Valley, North-western Rhodesia.

* *C. torquata* (nec Dobs.), Jentink, Notes Leyden Mus. x, p. 52 (1887); id. Cat. Syst. Mamm. p. 151 (1888).

Cotypes. Two skins with skulls (δ & φ), collected 11th and 14th April, 1908, respectively, by Mr. A. J. C. Molyneux, and presented to the Rhodesia Museum.

Although this species is remarkably like *G. darlingi* in outward appearance, its larger size is sufficient to distinguish it, while the less extended white patch on the crown and absence of white patches below the ears and on the throat prevent its being confused with *G. damarensis* and *G. lechei*, Thos.

LVII.—*A new Tree-Kangaroo from British New Guinea.* By OLDFIELD THOMAS.

THE British Museum owes to Mr. Walter Goodfellow the skin and skull of a remarkable new tree-kangaroo of the genus *Dendrolagus*, which was shot by its donor during his recent journey in search of paradise-birds in the mountains of British New Guinea. It is related to the striking species *Dendrolagus matschiei*, Foerst. & Rothschild*, from German New Guinea, the type specimen of which has been kindly lent me by Mr. Rothschild for comparison.

The new species may be called

Dendrolagus goodfellowi, sp. n.

A rufous-brown species with yellow feet, dark red ears, mottled tail, and two yellowish lines on the loins.

Fur straight, not woolly, about $2\frac{1}{2}$ –3 cm. in length on the back ; the hairs directed forwards and backwards from a pair of prominent whorls about halfway along the back ; in *D. matschiei*, the hair-division takes place at about the same point, but the whorls are less distinct. General colour above dark bistre-brown, suffused with rufous, the latter colour becoming more dominant posteriorly ; the bases of the hairs rufous, their median portion blackish and their ends tipped with shining buffy or drab, which gives a finely grizzled appearance to the body. Under surface and inner side of limbs ochraceous, becoming more rufous on the belly, where the light colour is narrowed to a breadth of only about 3 inches, owing to the extension downwards of the dark colour of the flanks. Head dull russet-brown, its hairs directed backwards to a hair-crest running across between the anterior corners of the ears ; the muzzle but little lighter

* Nov. Zool. xiv. pl. iv. (1907).

than the crown. Backs of ears very hairy, deep rich rufous, slightly darkening terminally; in *matsohiei* the ears are yellowish at their tips. Nape with two indistinct lighter lines on each side of a darker median one, these lines corresponding to those next to be described, but far less sharply defined. Rump with two prominent ochraceous parallel lines along each side of the spine, about 6 inches in length and an inch apart, dying away at the base of the tail. Fore-arms blackish in front, reddish brown externally, ochraceous on their inner aspect; hands golden yellow, the tips of the fingers browner. Hind legs tawny proximally, gradually paling to golden yellow on the feet, the ends of the toes reddish brown. Tail deep rufous at base, then irregularly mottled with rufous-brown and yellow, the yellow predominating along the middle, the tip dark brown.

Skull with the interorbital region much inflated, strongly convex upwards, and with a lateral projection on the inner wall of the orbit. Nasals broader in front than at the maxillo-premaxillary suture; postero-external corners rounded. First incisor, as in *D. dorianus*, much longer than the others.

Dimensions of the type (measured on the skin):—

Head and body 770 mm.; tail 845; hind foot 124.

Skull: basal length 109; greatest breadth 66; nasals, length 42·5, breadth anteriorly 14, mesially 11·2, posteriorly 19; interorbital breadth 26; palatal length 63; length of large upper premolar 10, of three anterior molariform teeth 20.

Hab. Owen Stanley Range, near Mt. Obree, British New Guinea. Alt. 8000'.

Type. Adult male. B.M. no. 8. 10. 10. 1. Collected 18th March, 1908, and presented by Walter Goodfellow, Esq.

This remarkably handsome tree-kangaroo, which I have named in honour of its donor, is widely different from any known species. Its tricolor fur, brown muzzle, dark red ears, and the light lines on its loins separate it readily from *D. matsohiei*, while it is so distinct from all the other species as to render any comparison with them unnecessary.

LVIII.—*A new Species of the Mascarene Genus Eliurus.*
By OLDFIELD THOMAS.

A RE-EXAMINATION of the specimens of *Eliurus* obtained by Dr. Forsyth Major during his famous expedition to Madagascar shows that among those hitherto referred to my

E. majori there are representatives of two species, the original *E. majori* from Ambohitombo, Tanala Country, Central Betsileo, and a second from Ampitambé, N.E. Betsileo. Adopting the specific name used provisionally in Madagascar by Dr. Major, I propose to name the new form

Eliurus penicillatus, sp. n.

Size about as in *E. majori*; colour-characters as in *E. tanala*, Major, i.e. with the digits, both fore and hind, the sides of the hands and feet, and the end of the tail white, these parts being mostly brown in *E. majori*; there is some variation, however, in these respects, the main distinction between the species being in the skulls.

Brain-case of *E. penicillatus* long, oval, tapering forward, of *E. majori* comparatively short and broad. Palatal foramina of *penicillatus* widely open, their combined width equal to or more than half their length; of *majori* narrow and contracted, their width much less than half their length. Molars of *penicillatus* much smaller, both shorter and narrower, than those of *majori*.

Dimensions of the type (measured in skin):—

Head and body 147 mm.; tail 164; hind foot 31; ear 21.

Skull: greatest length 36; basilar length 27·4; greatest breadth 17·4; nasals, length 14·5; interorbital breadth 5; palatilar length 15; diastema 10; palatal foramina 6·2 × 3·1; length of upper molar series 5·9.

Hab. Ampitambé, N.E. Betsileo, Madagascar.

Type. Adult female. B.M. no. 97. 9. 1. 149. Original number 602. Collected 20th July, 1895, by Dr. C. I. Forsyth Major.

LIX.—*A new Generic Name for an Orectolobid Shark.*

By C. TATE REGAN, M.A.

In 1906 (Proc. R. Soc. Queensland, xx. p. 27) Mr. Douglas Ogilby proposed the generic name *Brachaelurus* for Günther's *Chiloscyllium modestum*. In a more recent paper (Proc. R. Soc. Queensland, xxi. 1907, p. 3) he diagnosed the genus, but transferred the name to *B. colcloughi*, described as a new species, and on the next page made *C. modestum* the type of another genus, *Cirriscyllium*. As *B. colcloughi* does not appear to be congeneric with *B. modestus*, it becomes necessary to propose a new generic name for the former species; the two genera, with their synonyms, are:—

HETEROSCYLLIUM, nom. nov.

Brachaelurus (non Ogilb. 1906), Ogilb. Proc. R. Soc. Queensland, xxi. 1907, p. 3.

BRACHÆLURUS.

Brachaelurus, Ogilb. Proc. R. Soc. Queensland, xx. 1906, p. 27; Regan, Proc. Zool. Soc. 1908, p. 364.

Cirriscyllium, Ogilb. Proc. R. Soc. Queensland, xxi. 1907, p. 4.

Heteroscyllium colcloughi, described by Mr. Ogilby from Queensland, seems to differ generically from *Brachaelurus modestus* in the less depressed head and more inferior mouth, but especially in having the anal fin separated from the caudal by a distinct interspace (rather more than $\frac{1}{2}$ the length of its base).

LX.—A Collection of Freshwater Fishes made by Mr. C. F. Underwood in Costa Rica. By C. TATE REGAN, M.A.

Characiniæ.

1. *Tetragonopterus cuneus*, Günth.

Rio Iroquois (Atlantic Slope) and Rio Grande de Terraba.

2. *Tetragonopterus scleroparius*, sp. n.

Tetragonopterus fasciatus (part.), Günth. Cat. Fish. v. p. 322 (1864).

Tetragonopterus petenensis (part.), Günth. t. c. p. 326.

Tetragonopterus simus (part.), Bouleng. Boll. Mus. Torino, xiii. 1898, no. 329, p. 2.

Depth of body $2\frac{1}{2}$ to 3 in the length, length of head $3\frac{2}{3}$ to $4\frac{1}{3}$. Snout shorter than eye, the diameter of which is 3 to $3\frac{1}{2}$ in the length of head; interorbital width about $2\frac{1}{2}$ in the length of head. Maxillary extending to the vertical from anterior edge of eye; 2 to 5 maxillary teeth. Suborbitals broad, the lower edge of the second in contact with the lower limb of the preoperculum. 10 to 12 gill-rakers on the lower part of the anterior arch. 36 to 41 scales in a longitudinal series, 6 or 7 in a transverse series from origin of dorsal fin to lateral line, 5 to 7 between lateral line and base of pelvic fin. Dorsal 10-11; origin behind the pelvics; longest ray shorter than the head; free edge a little convex. Anal 27-32, with 24 to 28 branched rays; origin below end of

base of dorsal; free edge emarginate; length of base $\frac{1}{3}$ or less than $\frac{1}{3}$ the length of the fish. Pectorals extending to the pelvics, which reach the vent. Silvery, back darker; no humeral spot; a plumbeous lateral band ending in a blackish spot which extends to the end of the middle caudal rays.

Rio Iroquois.

Eleven specimens, 70 to 125 mm. in total length.

Five specimens from Western Ecuador (*Fraser*) should be referred to this species, and it is probable that the two small specimens from Panama (*Bransford*), recorded by Eigenmann and Ogle as *T. emperador*, also belong to *T. scleroparius*.

The name *Tetragonopterus simus* may be restricted to a species which differs from the one described above in the smaller eye ($\frac{2}{3}$ the length of head in a specimen of 72 mm.), the longer anal fin (extending forward to below the dorsal and measuring a little more than $\frac{1}{3}$ the length of the fish), and the absence of a well-defined black caudal spot.

Closely allied to *T. simus* is *T. microphthalmus*, Günth., from Peru, which resembles *T. simus* in the small eye, but agrees with *T. scleroparius* in the extent of the anal fin and the presence of a black caudal spot.

3. *Tetragonopterus emperador*.

Astyanax emperador, Eigenm. & Ogle, Proc. U.S. Nat. Mus. xxxiii. 1907, p. 26.

Depth of body $2\frac{3}{4}$ to $2\frac{1}{2}$ in the length, length of head 4. Snout shorter than eye, the diameter of which is 3 to $3\frac{1}{2}$ in the length of head; interorbital width $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length of head. Maxillary extending to below anterior $\frac{1}{4}$ of eye; 2 to 4 maxillary teeth. Suborbitals broad, the lower edge of the second in contact with the lower limb of the praoperculum. 11 gill-rakers on the lower part of the anterior arch. 46 to 49 scales in a longitudinal series, 8 to 10 in a transverse series from origin of dorsal fin to lateral line, 7 or 8 between lateral line and base of pelvic fins. Dorsal 10-11; origin behind the pelvics; longest ray shorter than the head; free edge straight or convex. Anal 28-30, with 25-27 branched rays; origin below or behind end of base of dorsal; free edge emarginate; length of base less than $\frac{1}{3}$ the length of the fish. Pectorals extending to the pelvics, which nearly or quite reach the anal. Silvery, back darker; humeral spot faint; caudal spot extending on to the fin, but not to the end of the middle rays.

Rio Grande de Terraba.

Three specimens, 90 to 105 mm. in total length.
This species was hitherto known only from a single small specimen (52 mm.) from Panama.

Siluridae.

4. *Arius evermanni*, Gilb. & Starks.

Depth of body 5 in the length, length of head $3\frac{3}{4}$ to $3\frac{5}{8}$. Breadth of head $1\frac{3}{8}$ in its length, diameter of eye 6-6 $\frac{1}{2}$. Fontanel produced into a groove which does not reach the parieto-occipital; parieto-occipital with a feeble keel anteriorly, which does not extend on to the occipital process, which is broader than long, with straight or concave sides and truncate or emarginate apex; dorsal shield small, subcrescentic. Width of mouth nearly $\frac{1}{2}$ the width of head; premaxillary band of teeth 4 times as long as broad; teeth on the palate obtusely conical, in two rather large subovate patches which are not very widely separated anteriorly; maxillary barbel not quite reaching the base of pectoral. 11 gill-rakers on the lower part of the anterior arch. Dorsal I 6-7; spine a little less than $\frac{3}{8}$ the length of head; adipose fin shorter than the dorsal. Anal 21-22. Pectoral spine $\frac{3}{8}$ or nearly $\frac{3}{8}$ the length of head, with the inner edge rather strongly serrated. Silvery; back bluish grey; fins more or less dusky.

Rio Ballena (Pacific Slope).

Two specimens, 230 to 270 mm. in total length.

This species differs from *A. fuerthii* in the longer head, shorter barbels, shorter fin-spines, and more strongly serrated pectoral spines.

5. *Rhamdia wagneri*, Günth.

Rio Ballena.

Cyprinodontidae.

6. *Gambusia rhabdophora*, sp. n.

Depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length, length of head $3\frac{1}{2}$ to 4. Snout as long as or shorter than eye, the diameter of which is $3\frac{1}{2}$ to 4 in the length of head; interorbital width equal to the distance from middle of eye to free edge of operculum. 27 or 28 scales in a longitudinal series. Dorsal 8-10; origin equidistant from end of snout and posterior part or posterior edge of caudal fin. Anal 9; origin below anterior $\frac{1}{2}$ of dorsal; first branched ray the longest. Pectoral

$\frac{2}{3}$ the length of head. Caudal subtruncate. Least depth of caudal peduncle $\frac{3}{5}$ the length of head. Scales with dark edges; a series of short dark vertical bars along the middle of the side; dorsal fin with 2 or 3 series of dark spots.

Volcano of Tenorio and Rio Grande de Terraba.

Nine specimens, 40 to 50 mm. in total length.

Allied to *G. episcopi*, Steind., *G. annectens*, Regan, and *G. terrabensis*, Regan, differing from the two first-named especially in the more posterior position of the anal fin, and from the last in the fewer dorsal fin-rays.

PETALOSOMA, gen. nov.

Differs from *Gambusia* in having the lower surface of the tail, behind the anal fin, compressed to a sharp edge.

7. *Petalosoma cultratum*, sp. n.

Body strongly compressed, its depth $3\frac{1}{3}$ in the length, length of head 4. Snout nearly as long as eye, the diameter of which is 3 in the length of head and a little less than the interorbital width. 35 scales in a longitudinal series. Dorsal 8; origin equidistant from eye and posterior edge of caudal fin. Anal 9, far in advance of the dorsal; first branched ray the longest. Pectoral shorter than the head; pelvics inserted below the middle of pectoral and extending to the anal. Olivaceous; a dark linear lateral stripe on the posterior part of the body.

Rio Iroquois.

A single specimen (δ), 50 mm. in total length.

8. *Pæcilia sphenops*, Cuv. & Val.

Volcano of Tenorio.

9. *Pæcilia retropinna*, sp. n.

Depth of body $3\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$. Snout as long as eye, the diameter of which is $3\frac{1}{2}$ in the length of head. Interorbital width equal to the distance from middle of eye to free edge of operculum. 30 scales in a longitudinal series. Dorsal 9; origin equidistant from anterior part of eye and posterior edge of caudal fin; free edge straight, the first branched ray the longest. Anal 10; origin a little in advance of that of the dorsal. Pectoral nearly as long as the head, extending to the base of the pelvics. Caudal rounded. Least depth of caudal peduncle $\frac{4}{5}$ the length of head. Olivaceous; scales with darker edges; fins pale.

Boruca.

A single specimen (♀) 77 mm. in total length.

Closely allied to *P. elongata*, in which the origin of the dorsal fin is equidistant from the end of the snout and the posterior edge of the caudal, or nearer the former, the pectoral extends to above the middle of the pelvics, and the interorbital width is not more than the distance from the posterior margin of the pupil to the free edge of the operculum.

10. *Pœcilia tropica*, Meek.

Depth of body $2\frac{1}{2}$ to $3\frac{1}{4}$ in the length, length of head $3\frac{2}{3}$ to $4\frac{1}{2}$. Snout shorter than eye, the diameter of which is $2\frac{1}{2}$ to 3 in the length of head. Interorbital width equal to the distance from middle of eye to free edge of operculum. 26 to 29 scales in a longitudinal series. Dorsal 9-10; origin equidistant from end of snout and middle (♀) or basal part (♂) of caudal fin; first branched ray (♀) or posterior rays (♂) the longest, the fin elevated in the male. Anal 9-10; origin a little behind that of the dorsal; first branched ray the longest. Pectoral as long as the head, extending nearly to the middle of the pelvics (♀). Caudal subtruncate. Least depth of caudal peduncle $\frac{4}{5}$ (♀) to $\frac{7}{8}$ (♂) the length of head. Olivaceous; dorsal with black spots, the basal half of the fin sometimes uniformly blackish; caudal with or without small blackish spots; sometimes a blackish blotch at the base of the caudal fin.

Rio Iroquois.

Six specimens, 60 to 100 mm. in total length.

This species differs from *P. sphenops* and agrees with *P. salvatoris* in the shape of the dorsal fin; it differs from the latter in the larger eye.

The synopsis of the Central American species of *Pœcilia* given in the 'Biologia Centrali-Americana' may be modified as follows, in order to include the species since described *:—

I. Origin of anal in advance of that of the dorsal.

A. Anal 7. 26 scales in a longitudinal series. [1866.
1. *spilurus*, Günth.,

B. Anal 8-11.

1. Dorsal rounded, the middle rays the longest; 27 to 30 scales in a longitudinal series 2. *occidentalis*, Baird & [Girard, 1853.

* This synopsis is based on female specimens only; in some species the males have not yet been described. They differ from the females in having the anal fin advanced and modified into an intromittent organ, whilst the dorsal is a little further forward, more or less elevated, and often differently shaped.

2. Dorsal with free edge nearly straight, the first branched ray the longest.

Origin of dorsal equidistant from end of snout and posterior edge of caudal fin, or nearer the former; pectoral extending to above middle of pelvies; 30 to 33 scales in a longitudinal series

[1886.]

3. elongata, Günth.,

Origin of dorsal nearer to posterior edge of caudal fin than to end of snout; pectoral extending to base of pelvies; 30 scales in a longitudinal series

4. retropinna, sp. n.

II. Origin of anal below or a little behind that of the dorsal; origin of dorsal nearer to base of caudal fin than to end of snout.

A. Depth of body $2\frac{1}{2}$ to $3\frac{1}{2}$ in the length; 26 to 30 scales in a longitudinal series.

Dorsal 8-11, rounded, the middle rays the longest

[1846.]

5. sphenops, Cuv. & Val.,

Dorsal 8-9, with the free edge a little convex, the anterior branched rays the longest; eye small, its diameter $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head (in specimens of 32 to 52 mm.) ..

Dorsal 10-11, with the free edge straight, the first branched ray the longest; eye rather small, its diameter $3\frac{1}{2}$ in the length of head (in specimens of 55 mm.)

Dorsal 9-10, with the free edge straight, the first branched ray the longest; eye large, its diameter $2\frac{1}{2}$ to 3 in the length of head (in specimens of 60 to 100 mm.)

[1907.]

7. salvatoris, Regan,

B. Depth of body 4 to $4\frac{1}{2}$ in the length; 31 scales in a longitudinal series

8. tropica, Meek, 1907.*9. tenuis*, Meek, 1907.

* * * *Pacilia spilonota*, sp. n.

Pacilia sphenops (part.), Regan, Biol. Centr.-Am., Pisc. p. 102, t. xiii. fig. 2 (1907).

Depth of body 3 to $3\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to 4. Snout shorter than eye, the diameter of which is $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head. Interorbital width equal to or a little longer than the postorbital part of head. 27 to 29 scales in a longitudinal series. Dorsal 8-9; origin equidistant from end of snout and posterior part (φ) or middle (δ) of caudal fin; free edge a little convex, the second branched ray the longest. Anal 8-9; origin below or a little behind that of the dorsal. Pectoral shorter than the head, extending to above anterior part of pelvies (φ). Caudal rounded. Least depth of caudal $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. Olivaceous; a black spot at the base of the dorsal fin.

San José.

Six specimens, 32 to 52 mm. in total length.

This species may not be distinct from *P. tenuis*, Meek, which is described as having a longer body (depth 4 to $4\frac{1}{2}$ in the length) and smaller scales (31 in a longitudinal series). *P. caucana*, Steind., seems to differ in the larger eye, $2\frac{1}{2}$ to 3 in the length of head in specimens of 82 to 43 mm.

III. Origin of anal below fourth or fifth dorsal ray; origin of dorsal equidistant from end of snout and base of caudal; 28 to 30 scales in a longitudinal series 10. *petenensis*, Günth., [1868.]

IV. Origin of anal below the middle of dorsal; origin of dorsal equidistant from end of snout and anterior part of caudal; 23 to 27 scales in a longitudinal series.

Depth of body about $2\frac{1}{4}$ in the length, length of head about 4 (in specimens of 50 mm.) .. 11. *couchiana*, Girard, [1859.]

Depth of body 2 to $2\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$ (in specimens of 60 mm.) .. 12. *maculata*, Günth., [1868.]

Mugilidae.

11. *Agonostomus percoides*, Günth.

Rio Iroquois.

Two specimens: one of 135 mm. in every way similar to the type of the species; the other, 270 mm. in total length, with thick upper lip.

XENORHYNCHICHTHYS, gen. nov.

Differs from *Joturus*, Poey, in the absence of teeth on the palatines and pterygoids.

12. *Xenorhynchichthys stipes*, Jord. & Gilb.

This species has been placed by Jordan and Evermann in the synonymy of *Joturus pickardi*, Poey, but it is quite distinct. In the type of *Agonostomus globiceps*, Günth., which seems to be identical with *J. pickardi*, the vomerine teeth form a triangular patch, bands of teeth are present on palatines and pterygoids, the snout is vertically truncated, and the maxillary extends a little beyond the vertical from the anterior edge of the eye.

In four young specimens of *X. stipes*, 150 to 190 mm. in total length, from the Rio Iroquois, the vomerine teeth form a transverse ovate patch, there are no palatine and pterygoid teeth, the snout is obliquely truncated, and the maxillary extends to below the middle of the eye. In these examples the soft dorsal, anal, and caudal fins have large blackish spots or oblique bars. As in *J. pickardi* the anal fin is formed of II 11 rays, the first spine very small, the two first articulated rays unbranched.

Cichlidae.

13. *Cichlosoma septemfasciatum*, sp. n.

Depth of body $1\frac{1}{2}$ to $2\frac{1}{2}$ in the length, length of head 3 to $3\frac{1}{2}$. Snout as long as or shorter than postorbital part of

head. Diameter of eye $3\frac{1}{2}$ to 4 in the length of head, interorbital width $2\frac{2}{3}$ to 3. Depth of preorbital equal to or less than the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; anterior teeth in both jaws somewhat enlarged; cheek with 3 to 5 series of scales; 5 or 6 gill-rakers on the lower part of the anterior arch. 28 or 29 scales in a longitudinal series, 4 or $4\frac{1}{2}$ in an oblique series downwards and backwards from origin of dorsal fin to lateral line, $1\frac{1}{2}$ to $2\frac{1}{2}$ between lateral line and scaly sheath at base of soft dorsal. Dorsal XVII-XVIII 8-10, commencing above the opercular cleft, the spines subequal from the fifth or sixth to the fifteenth or sixteenth, the last $\frac{2}{3}$ to $\frac{1}{2}$ the length of head; soft fin, when laid back, extending nearly to the middle of caudal or beyond. Anal VIII-X 7-8. Pectoral nearly as long as the head, extending to above the anal; outer ray of pelvic fin produced. Caudal rounded. Caudal peduncle $\frac{1}{2}$ to $\frac{2}{3}$ as long as deep. Body with seven dark cross-bars, of which the third, on the middle of the side, and the last, on the caudal peduncle, are much more strongly marked than the rest; fins without spots.

Rio Iroquois.

Fourteen specimens, 60 to 100 mm. in total length.

This species is very close to *C. spilurum*, which has $5\frac{1}{2}$ or 6 scales between the origin of the dorsal fin and the lateral line, the dorsal spines usually higher, the last $\frac{1}{2}$ to $\frac{3}{4}$ the length of head, and the body crossed by 7 vertical bars of equal strength, the last joining the ends of the soft dorsal and anal and followed by a vertically expanded spot at the base of the caudal fin.

14. *Cichlosoma lethrinus*, sp. n.

Depth of body about $2\frac{1}{3}$ in the length, length of head $2\frac{1}{2}$ to 3. Snout as long as or a little longer than postorbital part of head, with straight oblique profile. Diameter of eye $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length of head, interorbital width 3 to $3\frac{1}{4}$. Depth of preorbital $\frac{2}{3}$ to $1\frac{1}{2}$ the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; teeth of the outer series in both jaws moderate, gradually decreasing in size laterally; cheek with 5 series of scales; 8 gill-rakers on the lower part of the anterior arch. 29 to 31 scales in a longitudinal series, 4 or $4\frac{1}{2}$ in an oblique series downwards and backwards from origin of dorsal to the lateral line, $2\frac{1}{2}$ between lateral line and scaly sheath at base of anterior part of soft dorsal. Dorsal XVII-XVIII 10-12, commencing above the opercular cleft,

the spines subequal from about the fifth to the fifteenth, the last a little more than $\frac{1}{3}$ the length of head. Anal VI-VII 8-10. Pectoral shorter than the head, extending to above the first or second anal spine. Caudal rounded. Caudal peduncle deeper than long. Body with 6 dark cross-bars, the two first broad and more or less confluent; a more or less continuous blackish longitudinal band from eye to a spot on the upper part of the base of caudal; vertical fins dusky, the soft dorsal and caudal with series of pale spots.

Rio Iroquois.

Six specimens, 80 to 145 mm. in total length.

Of *C. altifrons*, the nearest ally of this species, I have seen two specimens from the Rio Grande de Terraba. These have 16 dorsal and 5 anal spines and 11 or 12 gill-rakers on the lower part of the anterior arch. The last dorsal spine measures nearly $\frac{1}{2}$ the length of the head and the subcontinuous fold of the lower lip is divided into two deep pendent lobes.

TOMOCICHLA, gen. nov.

Differs from *Herichthys* in having the pelvic fins inserted well behind the pectorals.

15. *Tomocichla underwoodi*, sp. n.

Depth of body $2\frac{1}{2}$ to $3\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$. Snout about as long as postorbital part of head. Diameter of eye $4\frac{1}{2}$ to 6 in the length of head, interorbital width $2\frac{1}{2}$ (adult) to 3 (young). Depth of preorbital 1 to $1\frac{1}{2}$ the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly or the lower a little shorter than the upper; fold of the lower lip continuous; cheek with 4 or 5 series of scales; 9 to 12 gill-rakers on the lower part of the anterior arch. 32 to 35 scales in a longitudinal series, $4\frac{1}{2}$ to $5\frac{1}{2}$ in an oblique series backwards and downwards from origin of dorsal to lateral line, 3 between lateral line and sheath at base of anterior part of soft dorsal. Dorsal XVI 13-15; middle spines subequal; last spine $\frac{1}{3}$ to $\frac{2}{3}$ the length of head; soft fin rounded, when laid back not or scarcely extending to the caudal. Anal IV 9-11. Pectoral $\frac{3}{5}$ to $\frac{4}{5}$ the length of head, not extending to above the anal. Caudal emarginate. Caudal peduncle as long as deep. 6 to 8 blackish cross-bars on the side, chiefly below the lateral line; soft vertical fins with or without series of dark spots, which may form reticulations.

Rio Iroquois.

Thirteen specimens, 120 to 260 mm. in total length.

This species has the dentition of *Herichthys cyanoguttatus*; the latter may be derived from a type similar to *Cichlosoma fenestratum*, with which it agrees in the deep body, strong dorsal spines, interrupted lower lip, insertion of pelvic fins nearly in the vertical from base of pectoral, &c. *Tomocichla underwoodi*, however, has the elongate body, short dorsal spines, and continuous lower lip of *C. godmani*, with which it also agrees in having the insertion of the pelvic fins far behind the base of the pectoral. Steindachner's *Heros lenticinosus* may prove to be a *Tomocichla*.

16. *Paraneetroplus sieboldii*, Kner & Steind.

Rio Grande de Terraba.

Gobiidae.

17. *Philypnus maculatus*, Günth.

Rio Ballena.

BIBLIOGRAPHICAL NOTICES.

Heredity. By J. ARTHUR THOMSON. London: John Murray, 1908. (Progressive Science Series.) Pp. i-xvi, 1-605.

HEREDITY has always possessed a strange fascination for mankind, though not until recent years has any real grip of the subject been obtained. We have as yet, indeed, done little more than clear a few pathways through the thick undergrowth of tradition and speculation which has grown up during centuries of crude experiment and rule-of-thumb practice.

The work so far accomplished, however, is sufficient to show that the riddle of heredity is one of the most difficult which the biologist has yet attempted to solve. Analyze and experiment as we will, that intangible property of pullulation peculiar to living matter still remains one of Nature's secrets. Whether it will ever be wrested from her time alone will prove, but the attempt is being made, and in earnest. Already an appalling amount of literature on the subject has come into being, not all of which is worthy of the theme. Prof. Thomson, however, set himself the task of sifting and systematizing this output, and that he has been singularly successful in winnowing the chaff from the grain is beyond dispute. The results of his labours are now presented to the world in a volume which will be regarded as the standard work of reference to this subject for some years to come. To the biologist it

will prove indispensable, while to the student of sociology and to the medical man it will probably come as a revelation, for it must be admitted that neither of these last has shown that grasp of the significance or the possibilities of heredity, certain exceptions apart, which the circumstances of their professions demand.

As a judicial summary of a peculiarly difficult subject Prof. Thomson's book is masterly, while from the point of view of clearness of exposition it has no rivals.

In the space at our disposal an exhaustive account of the contents of this book would be impossible. It must suffice, then, to point out one or two of its more important features, and to make mention of one or two small criticisms.

Anything like criticism of a book of this kind seems ungrateful, but the few comments we have to make are made in no captious spirit.

In the first place, then, we cannot help feeling that Prof. Thomson endeavours to draw too nice a distinction between heredity and inheritance. The former, he remarks, "is no entity, no force, no principle, but a convenient term for the *genetic relation between successive generations*," while inheritance, he says, "includes all that the organism is or has to start with in virtue of its hereditary relation." One cannot help feeling that this is putting "heredity" in a straight-jacket. In other words, the term "inheritance" supplants the more familiar "heredity," at any rate to all intents and purposes.

Our next grumble is at the omission of "opsonins" and their relation to disease, which we naturally expected to find in the otherwise most philosophical chapter on heredity and disease. The only reference thereto is contained in a passage where, referring to phagocytes and their relation to pathogenic microbes, he introduces the subject in the phrase "or as his [man's] 'opsonic index' improved."

The chapters on Mendelism are most admirable; nowhere else will there be found so complete and so illuminating a summary of all that pertains to Mendelism. But while the author is generous in his appreciation of this work, he is careful to utter a very necessary word of caution as to the need of restraining enthusiasm over the many triumphs which workers in this new field have attained; for he remarks, "In many ways . . . Weissman's somewhat subtler and more complex conception of determinants which work out a character by cooperative development appears to us to fit the facts better."

The chapter on the transmission of acquired characters leaves nothing to be desired, and may be studied with the greatest profit both by the medical man and the breeder; and this because among both there exists an appalling amount of misconception and, apparently, wilful blindness to observed facts. The sociologists stand in no less need of learning, and in the pages of this splendid treatise

they should find all they need to upset some of the fallacies that form the basis of many of their proposed remedies for the regeneration of mankind.

A work like the present has long been needed, but there are few who would have had the courage to undertake its preparation, and certainly no one could have achieved a more conspicuous success in the fulfilment of so onerous a task.

W. P. P.

A Book of Birds. By W. P. PYCRAFT, A.L.S., F.Z.S. With 30 full-page coloured Plates and many Illustrations in the Text. London : Sidney Appleton, 1908. Sm. 4to. Pp. viii, 155. (6s. net.)

This is the third volume of Sidney Appleton's 'Popular Natural History Books,' of which two volumes on British Flowering Plants and on Mammals of the World, both by W. F. Kirby, have appeared ; and a volume on Minerals, by Leonard J. Spencer, is promised shortly.

Mr. Pycraft is well known as an authority on the anatomy and structure of birds, and has given us in his introductory chapter of 27 pages a very useful outline of this branch of the subject, with numerous illustrations. The remaining 16 chapters contain a popular account of the more interesting groups of birds, with special reference to the species figured. The coloured plates represent from four to eleven species each, and most of the figures are well executed and easily recognizable ; and in some cases the eggs are also figured. It is to be regretted that Mr. Pycraft had not more space at his disposal, that he might have given at least a passing reference to some of the more interesting families not represented on the plates. Still he has done his best with his materials, and has given a good deal of general information, some of which may be new to many, if not most, of his readers. He feels very strongly on the subject of bird-destruction, and he never loses an opportunity of protesting against it—as, for instance, on p. 46, where we read of "the ghastly trophies which thoughtless women wear in their hats" (egret-feathers), and lower down on the same page, "There was a time when the Bittern was to be met with commonly in Great Britain, but drainage and that pest the 'collector' have done their work, so that at most but a few stragglers are now to be met with in our islands, and these are always promptly shot down." It is much to be regretted that it is still necessary to protest against the destruction of birds, ancient monuments, &c., even in England.

The book concludes with a good general Index.

Mr. Pycraft's book may be recommended to those who wish for an accurate and fairly comprehensive introduction to the study of birds.

CASBY, THOS. L. *A Revision of the Tenebrionid Subfamily Coniontinae.* ('Proceedings of the Washington Academy of Sciences,' vol. x. pp. 51-166; April 25, 1908.)

THE Author divides the Tenebrionids which have no coriaceous hind margins of the abdominal segments into the following sub-families:—Tentyriinae, Coniontinae, Asidinæ, and Zopherinæ. The Coniontinae are again subdivided into Præocini, Branchini, Coniontini, and Cœlini, the first of which are omitted in the present paper, being South American. The bulk of the paper consists of an elaborate and purely technical monograph, which cannot be further noticed here. In the Addenda an additional South-American group, Nycteliini, including the genera *Nyctelia* and *Nycteliana*, is referred to the Coniontini. Some general remarks on entomological bibliography and the relative validity of figures and descriptions follow, and the article concludes with some remarks and corrections relating to a former paper by the Author on the Tentyriinae.

C. HOUARD, Docteur de Sciences, Lauréat de l'Institut. *Les Zoocécidies d'Europe et du Bassin de la Méditerranée. Description des Galles. Illustration. Bibliographie détaillée. Répartition Géographique. Index Bibliographique.* 1365 figures dans le texte, 2 planches hors texte, 4 portraits. Tome premier. *Cryptogames, Gymnospermes, Monocotylédones, Dicotylédones.* (1^{re} Partie.) 8vo. Paris, 1908. Pp. 570.

MANY books have recently appeared on galls, but this is of considerable importance, being written mainly from a botanical standpoint, and may consequently be regarded as an amplification of Kaltenbach's well-known and most useful 'Pflanzenfeinde,' as far as galls are concerned. Under each plant we have the galls infesting it classed under groups and separately described, so as to allow of easy identification; and the numerous figures in the text are well executed and characteristic. No descriptions of insects, however, are given, but only of the galls. Under *Quercus* we were much surprised to read, on p. 249:—

"Minime bosselette, *Q. ped.* *Lestes viridis*, van der Lind 1296.
Pierre, 1902, p. 185.

F."

This refers to a paper thus noticed in the 'Zoological Record' for 1902:—Ins. p. 57. "1065. Pierre, Abbé. Sur la ponte d'un Neuroptère cecidozoon, *Lestes viridis*, Van d. Lind. Rev. Sci. Bourbonnais, xv. pp. 181-194." and p. 300 Ins. "*Lestes viridis*, ovi-position" (with the above reference).

We have called special reference to this most interesting and

important article, as we believe it has probably been overlooked by many neuropterists, owing to its having appeared in a comparatively little-known journal and to the very brief manner in which it is mentioned in the 'Zoological Record.'

We are sure that all agricultural entomologists and others interested in galls will find Dr. Houard's work of the greatest value, and we hope it may soon be completed.

W. F. K.

MISCELLANEOUS.

Generic Names of Polychæt Worms that have been preoccupied and remain unreplaced. By ROBERT T. LEIFER, M.B., F.Z.S., Helminthologist to the London School of Tropical Medicine.

<i>Amæa</i> , <i>Malmgren</i> , 1865.	<i>Macrochæta</i> , <i>Gruhe</i> , 1850.
<i>Ancistria</i> , <i>Quatrefages</i> , 1867.	<i>Macrophyllum</i> , <i>Schmarda</i> , 1861.
<i>Archidice</i> , <i>Kinberg</i> , 1865.	<i>Mylitta</i> , <i>Kinberg</i> , 1866.
<i>Arenia</i> , <i>Quatrefages</i> , 1867.	<i>Nicon</i> , <i>Kinberg</i> , 1865.
<i>Bulgia</i> , <i>Theel</i> , 1879.	<i>Nerine</i> , <i>Johnston</i> , 1838 (nec <i>Nerina</i>).
<i>Cabira</i> , <i>Webster</i> , 1879.	<i>Orid</i> , <i>Quatrefages</i> , 1867.
<i>Carobia</i> , <i>Ehlers</i> , 1904.	<i>Pallasia</i> , <i>Quatrefages</i> , 1848.
<i>Castalia</i> , <i>Savigny</i> , 1817 (nec <i>Castalius</i> , 1816).	<i>Parmenis</i> , <i>Malmgren</i> , 1867 (nec <i>Parmena</i>).
<i>Ceratocephala</i> , <i>Kinberg</i> , 1867.	<i>Peribæa</i> , <i>Kinberg</i> , 1865.
<i>Chrysotheremis</i> , <i>Kinberg</i> , 1866.	<i>Pherusa</i> , <i>Oken</i> , 1815.
<i>Cirronereis</i> , <i>Kinberg</i> , 1866.	<i>Phronia</i> , <i>Webster</i> , 1879.
<i>Clymene</i> , <i>Savigny</i> , 1817.	<i>Polybostrichus</i> , <i>Ersted</i> , 1842.
<i>Clymenia</i> , <i>Ersted</i> , 1844.	<i>Polyodontes</i> , <i>Renier</i> , 1817.
<i>Clytia</i> , <i>Grube</i> , 1855.	<i>Potamis</i> , <i>Ehlers</i> , 1888.
<i>Dasymallus</i> , <i>Grube</i> , 1844.	<i>Praxilla</i> , <i>Malmgren</i> , 1865.
<i>Demonax</i> , <i>Kinberg</i> , 1866.	<i>Praxithea</i> , <i>Malmgren</i> , 1867.
<i>Dindymene</i> , <i>Kinberg</i> , 1865.	<i>Prionognathus</i> , <i>Keserstein</i> , 1862.
<i>Disoma</i> , <i>Ersted</i> , 1844.	<i>Psamathe</i> , <i>Johnston</i> , 1837.
<i>Dujardinia</i> , <i>Claparède</i> , 1865.	<i>Schlegelia</i> , <i>Wagener</i> , 1879.
<i>Ephesia</i> , <i>Rathke</i> , 1843.	<i>Scione</i> , <i>Malmgren</i> , 1865.
<i>Eulepis</i> , <i>Grube</i> , 1875.	<i>Sige</i> , <i>Malmgren</i> , 1865 (nec <i>Siga</i>).
<i>Eumenia</i> , <i>Ersted</i> , 1844.	<i>Siphostoma</i> , <i>Otto</i> , 1820.
<i>Eunice</i> , <i>Cuvier</i> , 1817.	<i>Sphærodorum</i> , <i>Ersted</i> , 1842 (nec <i>Sphærodoris</i> , 1877).
<i>Eupista</i> , <i>M'Intosh</i> , 1885.	<i>Spiroglypha</i> , <i>Quatrefages</i> , 1865.
<i>Evarne</i> , <i>Malmgren</i> , 1865.	<i>Thoë</i> , <i>Kinberg</i> , 1866.
<i>Gymnosoma</i> , <i>Quatrefages</i> , 1865.	<i>Triceratium</i> , <i>Haswell</i> , 1882 (nec <i>Triceratium</i>).
<i>Halimede</i> , <i>Rathke</i> , 1843.	<i>Trachelophyllum</i> , <i>Levinsen</i> , 1888.
<i>Idalia</i> , <i>Quatrefages</i> , 1867.	<i>Venusia</i> , <i>Johnston</i> , 1865.
<i>Leiocephalus</i> , <i>Quatrefages</i> , 1867.	
<i>Lophonota</i> , <i>Costa</i> , 1841 (nec <i>Lophonotus</i>).	
<i>Lycastis</i> , <i>Savigny</i> , 1817 (nec <i>Lycastes</i>).	

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LXI.—*Descriptions of new Rhopalocera from the Upper Congo.* By G. T. BETHUNE-BAKER, F.L.S., F.Z.S.

Mycalesis hyperanthus, sp. n.

♂. Both wings dark blackish brown. Primaries with a small white-pupilled black spot between veins 5 and 6 near the termen; an obscure, small, but quite visible black spot (not pupilled) between veins 2 and 3, neither of these spots have any iris: secondaries with a dark grey sex dash close to the anal angle. Underside: both wings sienna-brown, with ocellated spots and with lines: primaries with a large dark spot in the middle of the cell, broadly edged all round except on the costa with pale ochreous brown, beyond which is a very broad, irregular, median dark band produced outwards between veins 3 and 5, and palely edged externally; spots of upperside showing through, but broadly ringed with pale yellowish which has a dark edging followed by a lighter one; the lower spot is very large and conspicuous and is pupilled with white; a dark fine subterminal line in a paler area: secondaries with the dark median irregular band similar to the primaries, palely edged laterally, but very definitely so externally; a postmedial series of seven spots as in the primaries in a pale area, that between veins 2 and 3 being large and that at the apex also somewhat larger than

the other five, which are small; terminal area as in the primaries.

Expanse 34 mm.

Hab. Makala, July; Beni-Mawambe, February 1906.

In my collection and that of Major Powell-Cotton.

This species is near to *M. analis*, Auriv.

Mycalesis uniformis, sp. n.

♂. Both wings uniform darkish brown. Primaries with a very small obscure white-pupilled black spot near the apex: secondaries with a blackish-brown tuft of hairs just below the angle of vein 2 between 1 α and 2, in addition to the tuft above the cell. Underside: both wings pale ochreous brown: primaries with a large cell-spot faintly outlined; a median obscure line and a distinct postmedian one, the latter palely edged; the subapical spot of the upperside showing through and having a pale yellowish iris; a similar spot, rather larger, between veins 2 and 3, between these are traces of two other similar spots: secondaries with a dark irregular median and postmedian line enclosing a slightly darker area, the postmedian line is palely edged externally; a series of seven subterminal white-pupilled black spots, with pale yellowish irides, which are edged with darker brown and again with pale obscure ochreous.

Expanse 55 mm.

Hab. Makala-Beni, July 1906.

In the Powell-Cotton collection.

Henotesia nigrescens, sp. n.

♂. Both wings deep velvety blackish brown, with small ocellated spots. Primaries with two small subapical intense black spots minutely but distinctly pupilled with white and having red irides which touch each other; a larger similar spot near the termen between veins 2 and 3: secondaries with a similar spot as in the primaries between veins 2 and 3, near the termen, with occasionally a trace of another smaller one above it. Underside: both wings tawny ochreous, closely suffused with fine, short, deep, rusty, vein-like, wavy lines, terminating to a large extent in the postmedian area by a prominent deep rusty line through both wings. Primaries with a broad greyish subterminal area in which the white-pupilled black spots show through, the upper two having a single ochreous iris, the lower one with a very broad ochreous iris with a dark outer edging: secondaries

with a rusty median transverse line and a curved series of seven or eight ocellated spots as in the fore wings.

Expanse 46 mm.

Hab. Makala, May and June 1906.

In my collection and that of Major Powell-Cotton.

Acrea lumiri, sp. n.

♂. Both wings deep orange-red, with black margins. Primaries with costa broadly black to the oblique stripe; apex and termen more broadly black; a broad black stripe beyond the cell connecting the costa with the termen, leaving an enclosed subovate patch of the red ground-colour; a fine short inner marginal dash from the base: secondaries with the apex and termen broadly black; base very restricted dusky; a very fine black dot at the end of the cell. Underside: primaries, basal area pale tawny red, enclosed patch ochreous; termen with a series of wedge-shaped pale tawny internervular short dashes and a suffusion of thin tawny irrorations: secondaries ochreous, with three small black basal dots; a median series of four larger ones, a black dot in the cell between these two series, and one beyond the median series; on the broad black termen a series of semi-ovate whitish internervular spots.

Expanse 36-41 mm.

Hab. Kissegneis to Lumiri, Albert Edward Lake, October.

In my collection and that of Major Powell-Cotton.

Near *A. alicia*, Sharpe.

Planema plagioscia, sp. n.

♂. Primaries with base black to the end of the cell, followed by a broad oblique band of orange-rufous occupying the whole of the postmedian area from the costa into the tornus, invading irregularly the basal area, and also in deep serrations the apical and terminal areas, which are blackish brown, the latter rapidly tapering into the tornus: secondaries with base up to the end of the cell very dark rusty brown, with a basal series of about four black spots; a median series of four, a curved series of eight spots, produced outward by the cell, which is closed by a double spot, and has one spot between it and that in the middle; postmedian area very broadly whitish, widening towards the tornus, with the veins dark brown; subterminal and terminal areas brownish.

Expanse 84 mm.

Hab. Beni-Mawambe, Congo Free State, February 1906.

In the Powell-Cotton collection.

Allied to *Planema aurivillii*, Stgr.

Planema macrosticha, sp. n.

♂. Both wings blackish brown, yellowish fawn-colour. Primaries with basal area black to end of cell, with a confluent black spot projecting forwards in the angle of veins 3 and 4; a broad postmedian band of yellowish fawn-colour from costa to termen below vein 3, but not reaching quite into the tornus, i. e. not below vein 1 α ; apical area blackish brown to below vein 3: secondaries sooty brown for a restricted basal area, not to the end of the cell; postmedian area very broadly yellowish pale fawn-colour right up to the tornus, invaded by the black veins and also by fine black internervular lines; termen broadly blackish brown at the apex, tapering down very finely to the tornus. Underside: secondaries with base Indian-red, with two or three basal small spots; a median series of four, an irregular curved series of eight spots, those between veins 5 and 6 and 6 and 7 shifted outwards; postmedian band whitish, not half the width of the yellowish band above, rest of area exceedingly broadly brownish grey.

Expanse 80 mm.

Hab. Makala, June 1906.

In the Powell-Cotton collection.

Near *Acræa dewitzi*, Stgr.

Euphædra symphona, sp. n.

♂. Palpi ochreous below, with a dark lateral stripe, fringed palely with longish hair above; head blackish, with two whitish dots below the antennæ and two larger ones above; eye-sockets edged with white. Both the wings deep bronzy green, much deeper in tone near the termen: primaries with the area between the cell and apex darker, with a white irregular oblique white stripe from vein 8 to just beyond vein 4, a small white patch at the apex; fringes with fine, short, white internervular intersections. Underside: both wings dull sienna-brown: primaries with two black spots lengthwise in the cell and a small one closing its upper extremity; all the white marks of the upperside show through: secondaries with two black spots in the cell and one at the extreme base, all in line; area above vein 8 crimson, below which to the lower margin of the spots is an indefinite patch of pale greyish, with a trace of the usual pale-angled dash between veins 7 and 8 about midway along the former.

There is the least trace of a row of subterminal spots in a very slightly paler subterminal area in both wings.

Expanse 84 mm.

Hab. Beni-Mawambe, Congo Free State, February 1906.
In the Powell-Cotton collection.

Euryphene leptotypha, sp. n.

♂. Both wings black, with pale steel-blue suffusion : primaries with the suffusion confined to the inner marginal area below the cell and vein 3, not extending to the base nor to the tornus ; the oblique white band from vein 10 to 5 terminates below the latter vein in a bluish-white patch reaching nearly to the termen ; apex with a small defined white patch : secondaries with the blue suffusion extending all over the wing below vein 8 almost to 1a, and well into the postmedian area, leaving the terminal area broadly and evenly black. Underside uniformly pale bronzy green in both wings : primaries with the white marks only showing through, the oblique white band only reaching just over vein 5 : secondaries with an irregular whitish angled dash in the middle of the costa between veins 7 and 8, with the trace of a dusky subterminal line, in front of which is a trace of a dusky postmedian curved band roughly parallel with the subterminal line.

Expanse 86 mm.

Hab. Beni-Mawambe, Congo Free State, March 1906.
In my collection and that of Major Powell-Cotton.

Euryphene makala, sp. n.

♂. Upperside similar to the preceding species (*E. leptotypha*, B.-B.), except that the narrow oblique band of the primaries has developed into a broad bluish-white oblique patch, extending below and beyond vein 5 into a yet larger patch which reaches well below vein 3. Underside of both wings brownish olive-green : primaries with the pale markings showing through, the oblique patch, however, very slightly so ; in the cell there are four spots darkly outlined—a narrow small oval one at the base, two in the middle below each other, the upper smaller one being a twin spot, the lower larger and irregular, the fourth much larger, closing the cell ; a trace of an upright, postmedian, brownish, curved stripe tapering upwards to about vein 5 ; an obscure trace of a second similarly coloured band nearer the termen, followed by an obscure trace of a like-coloured subterminal line : secondaries with a dark point at the base of the cell, followed by two small round spots sharply outlined with black ; a

most obscure trace of a dusky, median, curved band, followed by a trace of a subterminal row of internervular scallops.

Expanse 89 mm.

Hab. Makala, Congo Free State, March 1906.

In my collection.

Euryphene luteola, sp. n.

♂. Both wings deep velvety blackish bronzy green: primaries with a paler (slightly yellowish) bronzy green inner marginal suffusion below the cell and vein 3, and not extending to the base nor to the tornus; in the cell are three dark spots—a small one at the base, a large irregular one right across the cell at its centre, and a larger one closing the cell; a yellowish oblique band beyond the cell terminating below and beyond vein 5 in an indefinite obscure yellowish patch; apex with a small yellowish spot (occasionally absent); an obscure row of subterminal dark spots: secondaries with the bronzy suffusion all over the wing to beyond vein 2, and extending almost into the subterminal area in some lights even up to the termen; a trace of a dark subterminal line. Underside: both wings olive-green, with all the marks of the upper surface more or less showing through, the costa of the primaries being pale bluish white to halfway up the cell, with a subterminal row of internervular dark points, occasionally absent: secondaries with three blackish spots in the cell (one at the base, and two below each other); cell closed by a finely outlined dash; an angled white dash in the middle of the costa between veins 7 and 8; an obscure row of dusky spots in the postmedian area, followed by an obscure dusky line in the subterminal area; the inner marginal area below the cell and vein 8 tinged with ochreous.

Expanse 77 mm.

Hab. Makala-Beni, July; Ituri Forest, Mawamba-Makala, March.

In my collection and that of Major Powell-Cotton.

Euryphene chloëropis, sp. n.

♂. Both wings bronzy bluish green: primaries with a black mark filling the base of the cell, a narrow waved dash beyond it, followed by two spots; cell closed by a largish spot, with the internervular vein-spaces beyond shortly filled with black, descending in a cloudy oblique band into the tornus; the lower margin of the cell has a black dash below it up to vein 2; apical area blackish, with a trace of a small

white patch at the apex : secondaries with a broad blackish termen, with a slight bronzy-green hue in certain lights. Underside : both wings dirty greenish : primaries with a short, very pale bluish costal dash at the base, with two spots across the middle of the cell outlined with blackish, and a larger similar spot at the end of the cell ; a trace of a curved postmedian stripe between vein 4 and the inner margin ; apex with a small white patch : secondaries with two darkly encircled spots across the middle of the cell, the lower one at times obscure ; inner marginal area with yellowish tawny hairs.

Expanse 72 mm.

Hab. Makala, Congo Free State, June 1906.

In my collection and that of Major Powell-Cotton.

Euryphene cottoni, sp. n.

♂. Both wings blackish brown and tawny in alternate stripes and spotted rows : primaries with three cell-spots (a small one at the base, a large twin spot in the middle, a large black one at the end), between each of them is a waved black line ; beyond the cell is a large, indefinite, irregular spot confluent with an obliquely receding black-spotted row, which is succeeded by a slightly oblique broad dark band interrupted at the veins and angled to the costa about vein 6 ; from here to the termen the wing is blackish brown, with a subterminal row of large blackish spots surrounded with tawny : secondaries with the base more or less dark ; a figure-8 spot in the cell, which is closed by a narrow oblong dash with tawny centre ; a broad median tawny band, followed by a broad curved dark band tapering somewhat towards the inner margin ; a postmedian curved row of large black spots broadly surrounded with tawny ; a broadish, definite, black, scalloped, subterminal line ; termen broadly dusky tawny. Underside : both wings pale ochreous brownish, with all the markings of the upperside more or less repeated in a modified form : in the secondaries the postmedian row of large spots is replaced by a series of fine dark dashes.

♀. Both wings paler brown, with the tawny marks replaced by dusky ochreous, whilst in the primaries the oblique postmedian tawny band is replaced by a similar conspicuous oblique band of clear pale ochreous, and in the secondaries the outer median area is very broadly and indefinitely of the same colour.

Expanse, ♂ 60, ♀ 74 mm.

Hab. Makala, March; Beni-Mawambe, February 1906; and other localities.

In my collection and that of Major Powell-Cotton.

Allied to *E. severini*, Auriv.

Diestogyna unopunctata, sp. n.

♂. Both wings tawny ochreous, with dark spots and markings. Primaries with a large spot in the middle and at the end of the cell, preceded in each case by a dark dash; a dark spot beyond the end of the cell; a median row of three internervular spots below the angle of veins 4, 3, and 2; a postmedian row of dark spots followed by a second somewhat obscure similar row; termen with a trace of dark internervular dashes; secondaries with base dark; a darkly outlined spot closing the cell; a postmedian dark band, followed by a row of dark spots; termen broadly dark, preceded by a row of dark scallops. Underside: both wings more or less ochreous brownish, pinkish in parts: primaries with a dark spot across the middle of the cell and a paler one at the end, followed by a darker one, beyond which is a little pinkish scaling; a waved postmedian row of dark points, the three uppermost ones with fine whitish internal edging, the underside marks more or less showing through: secondaries with a large velvety chocolate spot in the cell surrounded by pinkish scales; a postmedian row of white points; upperside markings showing through slightly.

Expanse 52 mm.

Hab. Mawamba-Makala, Congo Free State, March 1906.

In the collection of Major Powell-Cotton.

Diestogyna mawamba, sp. n.

♂. Both wings very dark brown, with an indigo-bluish suffusion in certain lights: primaries with two large dark spots in the cell at the middle and end, preceded by a dark dash; a largish dark spot beyond the end of the cell; an internervular irregular dash below the angle of vein 3, with a second below vein 2; a postmedian waved row of dark spots, followed by a subterminal one: secondaries with the area below and beyond the cell very dark, above the cell and beyond paler brownish, all markings most obscure; a trace of a postmedian row of dark spots followed by a trace of a subterminal row of dark dashes. Underside with base of primaries darkish brown to beyond the cell, area beyond ochreous; the spots of the upperside show through in the cell; postmedian area irrorated more or less with grey; a

postmedian row of dark points, the lower ones in obscure indefinite spots; a subterminal scalloped dark line; termen rusty red, expanding inwards at the radial area: secondaries with base dark rusty red, with a small yellowish patch above the cell; a small dark spot in the cell; postmedian area ochreous, very strongly suffused nearly all over and to the termen with crimson and rusty red, the markings being most obscure; a trace of a postmedian scalloped row of markings, followed by a definite row of strongly scalloped dashes filled internally with grey.

♀. Primaries with base and area below the cell tawny almost to the tornus, upper and terminal areas blackish brown; the usual spots in the cell as in the ♂; an irregular, pure white, oblique, broadish dash from the costa beyond the cell to vein 2; a subapical curved row of four white dots: secondaries tawny, with base slightly darker, edged with a fine dark strongly serrated line; a trace of a row of postmedian spots; a subterminal dark row of strongly scalloped markings, with a dark spot preceding each of the scallops; termen brownish. Underside: primaries entirely dark brown, with the cell-marks just visible and the white markings very prominent: secondaries with base entirely dark to the end of the cell, very irregularly terminated; beyond this the wing is dirty straw-coloured; termen brownish to vein 3, pale area irrorated with grey, with a postmedian row of white points, and the upperside scallops showing very slightly through.

Expanse, ♂ 56, ♀ 62 mm.

Hab. Mawamba-Makala, Congo Free State, March 1906.

♂ in the Powell-Cotton collection, ♀ in my collection.

I believe I am right in allocating my female to Major Powell-Cotton's male.

Deistogyna luteostriata, sp. n.

♂. Both wings brown, with pale ochreous stripes and with the various brown spots and markings edged more or less finely with pale ochreous: primaries with three large cell-spots, with a fourth just beyond the cell; a broad oblique brown band from the end of the cell to the inner margin before its middle, this band is deeply invaded with pale ochreous about its centre; beyond this are two large brown spots below vein 2; a subterminal row of large inter nervular spots slightly curved ending at vein 2: secondaries with a basal and a median pale ochreous oblique stripe; a subterminal row of large spots edged broadly with pale ochreous;

a second subterminal smaller row edged externally with a very obscure subochreous line. Underside pale ochreous brownish in both wings for the basal half, edged with a pale indefinite line; beyond this the wings are paler ochreous, with the dark patches of the upperside more or less showing through, and in both wings a postmedian and a subterminal row of pale spots, waved in the primaries and curved in the secondaries.

Expanse 59 mm.

Hab. Beni-Mawambe, Congo Free State, February 1906.
In my collection and that of Major Powell-Cotton.

Charaxes W-brunnea, sp. n.

♂. Both wings pearly greenish white: primaries with the costa narrowly pale greyish brown; apex broadly black, with a single pearly greenish-white spot; termen blackish, of moderate width, the underside markings showing through in the median area and in the subterminal area: secondaries spotless, with the tail and anal angle up to vein 4 brownish. Underside greenish white, more green than white: primaries with a transverse broad dark band from the costa to about vein 2 across the end of cell; a subterminal, angled, waved brownish line, somewhat spotted: secondaries with a very broad dark V-shaped basal mark nearly into the anal angle and up across the end of the cell to the costa, the combination on the two wings forming a perfect W; anal angle and tail dark brown; subterminal line brownish, somewhat spotted.

Expanse 59 mm.

Hab. Mawamba-Makala, March 1906.
In the Powell-Cotton collection.

Celænorhinus nigropunctata, sp. n.

♂. Primaries dark brown, covered more or less with subochreous scales; a large, broad, irregular, yellow hyaline patch across the outer half of the cell, with a small yellow spot above it on the costa and a double spot about its middle from the lower margin to vein 1 a; three small spots below the costa a quarter from the apex; a yellow dash between veins 2 and 4; a small subbasal dot just above vein 1 a; all the markings are hyaline and orange-yellowish: secondaries dark brown, with subochreous suffusion; a black irregular basal band; a similar very irregular and interrupted median band, and a similar more interrupted postmedian band; veins from here to termen black, termen broadly blackish. Underside: primaries as above, but with costa yellow up to end of

hyaline patch, and inner margin yellow : secondaries black, with costa bright orange, with two spots confluent with costa (one at its middle, a second near the end) ; a subochreous and obscure spot in the cell ; a waved, obscure, subochreous median row of four spots ; a similar postmedian row of five or six spots, these are more obscure except a twin pair below vein 2.

Expanse 40 mm.

Hab. Makala, Congo Free State, May 1906.

In the Powell-Cotton collection.

Celaenorrhinus beni, sp. n.

♂. Both wings black, more or less suffused with orange-tawny scales : primaries with a deep yellowish hyaline patch, very irregular from the costa over the outer half of the cell nearly into the tornus, invaded considerably below vein 2 by the ground-colour ; a confluent subapical small patch formed by three spots coalescing ; a subterminal small twin spot across vein 5 ; a wedge-shaped dash shifted inwards between veins 2 and 3 : secondaries with the costa to vein 7 black, the rest of the wing bright orange-tawny ; a subapical orange band invading the black costal area, and extending somewhat down the termen as a spotted row ; an orange line closing the cell. Underside sooty brown : primaries with all the hyaline spots showing through : secondaries slightly suffused with tawny ; a yellowish spot in the cell, which is closed by a yellowish dash ; fringes orange, interrupted at the veins. In some specimens there is on the underside of the secondaries a postmedian row of yellowish spots roughly parallel with the termen.

♀. Similar to the male, but duller, and on the secondaries instead of being as in the male there is a row of four sub-terminal spots from vein 7 to 4.

Expanse, ♂ 44, ♀ 54 mm.

Hab. Makala-Beni, Congo Free State, July 1906.

In my collection and that of Major Powell-Cotton.

Osmodes cottoni, sp. n.

♂. Both wings bright orange-tawny : primaries with basal area dark ; a black dash in the cell and a broad deep black dash beyond the cell two-thirds to the termen ; margin below vein 1 a black, on the half of internervular space between 1 a and 2 black, with a patch of obscure orange scales near the termen ; subterminal area darker in colour ;

termen rather narrowly black: secondaries with the costa blackish to the cell; cell covered with deep blood-red scales; termen finely black, inner marginal fold black. Underside blackish, with a slightly superficial tawny hue, the orange areas of the upperside showing definitely through: secondaries dark tawny, termen and inner marginal fold blackish, tornus broadly blackish; a broad orange-tawny band in the postmedian area; four prominent small white spots (one below vein 8 two-thirds along it, another below vein 2 with a yellow spot below it, one at the end of the cell, another in a line with it below vein 6); all these white spots are encircled with black.

Expanse 34 mm.

Hab. Makala, June and July 1906.

In my collection and that of Major Powell-Cotton.

Parnara anelia, sp. n.

♂. Both wings dirty brown, with hyaline spots: primaries with a spot below the angle of vein 3 and a smaller one in the angle; a minute dot further out above vein 4; a dot shifted a little inwards above 7, with a minute dot above it: secondaries with a short, transverse, postmedian series of four dots from vein 2 to 6; fringes greyish. Underside: both wings tinged with greyish, with the hyaline spots as above.

Expanse 32 mm.

Hab. Mawamba-Makala, March 1906.

In the Powell-Cotton collection.

Pandaleodes makala, sp. n.

♂. Primaries blackish, with hyaline spots, two near the end of the cell, a larger one below them further outwards below vein 3, a small one above its upper angle, a small one yet further out between veins 4 and 5, and three subcostal ones rather nearer the cell; a trace of a yellowish spot below the large one between veins 2 and 3, this is occasionally absent: secondaries, base black to half the cell; costa black to vein 6, extending down the termen to about or below vein 5; a black dash from the base to nearly halfway to the termen, inner marginal fold black. Underside: primaries black, tawny in the cell and beyond nearer the costa; hyaline spots as above; yellow spot below vein 2 prominent, with a yellowish indefinite dash to the tornus: secondaries pale straw-colour; costa dark brown, interrupted before the apex;

an irregular jagged broad band across the end of the cell to vein 1a; a dark patch just below the apex; the least trace of a postmedian line; a trace of a terminal scalloped row.

Expanse 38 mm.

Hab. Makala, May to July.

In my collection and that of Major Powell-Cotton.

Ceratrichia hollandi, sp. n.

♂. Primaries blackish, with a small spot at the end of the cell; two smaller ones below each other near the apex below veins 8 and 7; a minute one below 6 nearer the termen, another shifted inwards below 5 and another more inwards below 4: secondaries with base and costa to vein 6 blackish up to termen, rest of wing lemon-yellow, becoming slightly orange at the termen. Underside: primaries blackish, tawny yellowish along costa and in the apical area, all the spots of the upper surface showing through and encircled with black: secondaries lemon-yellow, with costa narrowly brown and a brown patch at the apex; a brown dot at the end of the cell, with a brown spot above it and another below it; two spots on the inner edge of the apical patch; a spot in the middle of the fold and a small dot near the termen below vein 3; most of the spots have yellow pupils.

Expanse 38 mm.

Hab. Fort Portal, January 8, 1906.

In the Powell-Cotton collection.

Ceratrichia paucipunctata, sp. n.

♂. Both wings uniform very dark brown: primaries with a small white dot at the end of the cell, another between veins 2 and 3 at a third along, yet another shifted slightly outwards between 3 and 4, and a fourth between veins 6 and 7: secondaries spotless. Underside as upperside.

Expanse 36 mm.

Hab. Toro, Kisindi Road, January 1906; Makala, June.

In my collection and that of Major Powell-Cotton.

Andronymus fenestrella, sp. n.

♂. Primaries sooty blackish, with a hyaline spot in the angle of vein 2, a small one near the angle of vein 3, and three hyaline dots in triangular position below the costa about a third from the apex: secondaries sooty blackish, with a large subbasal median area of hyaline surrounded and intersected with pale straw-yellow; a pale yellowish dash

along the fold; the sexual pencil of long hairs pale buff tipped with grey.

Expanse 32 mm.

Hab. Makala-Beni, Congo Free State, July 1906.

In the Powell-Cotton collection.

LXII.—*A Revision of the British and Irish Fishes of the Genus Coregonus.* By C. TATE REGAN, M.A.

FOUR species of *Coregonus* have usually been recognized as pertaining to the British fauna, viz.: *C. oxyrhynchus*, Linn., the migratory Houting, which is common on the coasts and in the rivers of continental Europe from Scandinavia to Holland, and is occasionally captured in our southern and eastern counties; *C. clupeoides*, Lacep., the Powan of Loch Lomond, Schelly of Ullswater and Haweswater, and Gwyniad of Bala Lake; *C. pollan*, Thomps., the Pollan of Ireland; and *C. vandesi*s, Richards., the Vendace of Lochmaben.

Two years ago I described the Vendace of Derwentwater and Bassenthwaite as a new species, *C. gracilior*, differing from the Lochmaben Vendace in the more elongate body and more slender caudal peduncle, smaller head, shorter paired and lower unpaired fins, and in usually having a ray more in the dorsal fin. My description was based on five specimens; eight more are now in the British Museum collection, and agree well enough with the types, but the differences from *C. vandesi*s are so slight that it may be best to recognize *C. gracilior* as a subspecies only.

A fine series of the Pollan of Lough Erne show that, as observed by Yarrell, this fish has usually a deeper body than the Lough Neagh Pollan; also, as a rule, there is a scale more between the lateral line and the base of the pelvic fin. These and other slight differences are here recognized by describing the Lough Erne fish as a new subspecies of *C. pollan* under the name *C. altior*. The Pollan of the lakes of the Shannon system has already received the name *C. elegans* from Thompson; it is here regarded as a second subspecies, differing from the typical *C. pollan* in the shorter maxillary and also in having the scales usually more numerous, especially when counted in a transverse series or round the caudal peduncle.

I have examined two spirit-specimens of the Loch Lomond

Powan (*C. clupeoides*, Lacep.), and have compared with them a good series of the Schelly of Ullswater and Haweswater, which is very similar, but differs at least in having more scales round the caudal peduncle (22 to 24 instead of 20 or 21), whilst the head and interorbital region are somewhat broader; the presence of small blackish spots on the sides, which are very variable, sometimes extending all over the head and body and on to the vertical fins, suggest the new subspecific name *stigmaticus* for this form. The Gwyniad of Bala Lake (*C. pennantii*, Val.) is a better defined race; when compared with Powan or Schelly of the same size the eye is seen to be rather larger, and consequently the maxillary extends a little beyond instead of to the vertical from the anterior edge of the eye, except in one very large specimen (400 mm.); the scales in a transverse series are usually more numerous, the anal fin usually longer, and the interorbital region somewhat narrower than in the Powan or the Schelly.

Synopsis of the Species and Subspecies.

I. Lower jaw projecting.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length; caudal peduncle 1 to $1\frac{1}{2}$ as long as deep. Dorsal fin with 7 to 9 branched rays, the longest from $\frac{1}{3}$ to $\frac{1}{2}$ as long as the head; pectoral extending $\frac{2}{3}$ to $\frac{3}{4}$ of the distance from its base to that of the pelvics

1. *vandesiæ*.

Depth of body 4 to 5 in the length; caudal peduncle $1\frac{1}{2}$ to 2 as long as deep. Dorsal fin with 8 to 10 branched rays, the longest $\frac{2}{3}$ to $\frac{3}{4}$ the length of head; pectoral extending $\frac{3}{4}$ to nearly $\frac{2}{3}$ of the distance from its base to that of the pelvics

1 a. *gracilior*.

II. Jaws equal anteriorly.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length; maxillary extending to below anterior $\frac{1}{3}$ of eye or beyond, its length $\frac{2}{3}$ to $\frac{4}{5}$ of the length of head; $7\frac{1}{2}$ to 9 scales between lateral line and base of pelvic fin, 19 to 22 round the caudal peduncle

2. *pollan*.

Depth of body $3\frac{1}{2}$ to 4 in the length; maxillary extending to below anterior $\frac{1}{3}$ or anterior $\frac{1}{2}$ of eye, its length from a little more than $\frac{1}{3}$ to a little less than $\frac{1}{2}$ of the length of head; $8\frac{1}{2}$ to 10 scales between lateral line and base of pelvic fin, 21 to 24 round the caudal peduncle

2 a. *altior*.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length; maxillary extending to below anterior $\frac{1}{3}$ of eye, its length $\frac{1}{2}$ to $\frac{2}{3}$ the length of head; 8 to 10 scales between lateral line and base of pelvic fin, 22 to 26 round the caudal peduncle

2 b. *elegans*.

III. Lower jaw included within the upper.

A. Snout vertically truncated.

Anal fin with 9 to 11 branched rays; $7\frac{1}{2}$ to $8\frac{1}{2}$ scales between lateral line and base of pelvic fin, 20 or 21 round the caudal peduncle; interorbital width $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head 3. *clupeoides*.
 Anal fin with 10 to 12 branched rays; 7 to $8\frac{1}{2}$ scales between lateral line and base of pelvic fin, 22 to 24 round the caudal peduncle; interorbital width 3 to $3\frac{1}{2}$ in the length of head 3 a. *stigmatus*.
 Anal fin with 11 to 18 branched rays; 8 to 10 (usually 9) scales between lateral line and base of pelvic fin, 22 to 24 round the caudal peduncle; interorbital width $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head 3 b. *pennantii*.
 B. Snout produced, conical 4. *oxyrhynchus*.

1. *Coregonus vandesi*s, Richards.

THE VENDACE.

*Coregonus vandesi*s, Gunth. Cat. Fish. vi. p. 194 (1806); Day, Fish. Britain, ii. p. 128, pl. cxxiii. fig. 1 (1884); Regan, Ann. & Mag. Nat. Hist. (7) xvii. 1908, p. 180.

Depth of body $3\frac{3}{4}$ to $4\frac{1}{4}$ in the length, length of head $4\frac{1}{2}$ to $4\frac{3}{4}$. Snout shorter than eye, the diameter of which is $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head; interorbital width $3\frac{1}{2}$ to 4 in the length of head. Lower jaw projecting; maxillary extending to below anterior $\frac{1}{2}$ of eye, its length about $\frac{1}{3}$ the length of head. 26 to 30 gill-rakers on the lower part of the anterior arch. 63 to 72 scales in a longitudinal series, $7\frac{1}{2}$ to 9 in a transverse series from origin of dorsal fin to lateral line, 6 or 7 between lateral line and base of pelvic fin, 20 to 22 round the caudal peduncle. Dorsal with 7 to 9 branched rays; origin nearly equidistant from end of snout and base of caudal fin; longest ray from $\frac{1}{4}$ to as long as the head. Anal with 9 to 12 branched rays. Pectoral extending $\frac{3}{4}$ to $\frac{2}{3}$ of the distance from its base to the pelvics, which are inserted below or a little behind the origin of the dorsal. Caudal peduncle 1 to $1\frac{1}{2}$ as long as deep, its least depth $\frac{2}{3}$ or a little more than $\frac{2}{3}$ the length of head. Silvery or golden, back greenish blue; fins pale or dusky.

Castle Loch and Mill Loch, Lochmaben, Dumfriesshire.

Seventeen examples, measuring up to 195 mm. in total length; only two of these have 9 branched rays in the dorsal fin.

Subsp. a. *Coregonus gracilior.*

THE DERWENTWATER VENDACE.

Coregonus gracilior, Regan, Ann. & Mag. Nat. Hist. (7) xvii. 1906,
p. 181, pl. vii.

Depth of body 4 to 5 in the length, length of head $4\frac{1}{2}$ to 5. Snout nearly as long as or shorter than eye, the diameter of which is $3\frac{1}{2}$ to 4 in the length of head and nearly equal to the interorbital width. Lower jaw projecting; maxillary extending to below the anterior $\frac{1}{4}$ of eye, its length about $\frac{1}{3}$ the length of head. 25 to 29 gill-rakers on the lower part of the anterior arch. 60 to 72 scales in a longitudinal series, 7 or 8 in a transverse series from origin of dorsal fin to lateral line, 6 or 7 between lateral line and base of pelvic fin, 17 to 21 round the caudal peduncle. Dorsal with 8 to 10 branched rays; origin equidistant from end of snout and base of caudal or a little nearer the former; longest ray $\frac{3}{4}$ to $\frac{4}{5}$ the length of head. Anal with 9 to 11 branched rays. Pectoral extending from $\frac{1}{2}$ to nearly $\frac{2}{3}$ of the distance from its base to the pelvics, which are inserted below or a little behind the origin of the dorsal. Caudal peduncle $1\frac{1}{2}$ to 2 as long as deep, its least depth $\frac{4}{5}$ to $\frac{2}{3}$ the length of head. Silvery, back bluish; fins pale.

Derwentwater and Bassenthwaite Lakes, Cumberland.

Thirteen specimens, measuring up to 190 mm. in total length; two of these have been presented by Mr. S. Venour, four are in the Keswick Museum, and the remainder have been received from Mr. H. A. Beadle. Two have 10 branched rays in the dorsal fin, eight 9, and three 8.

2. *Coregonus pollan.*

THE POLLAN.

Coregonus pollan, Thompson, Proc. Zool. Soc. 1835, p. 77; Günth. Cat. Fish. vi. p. 194 (1866); Day, Fish. Britain, ii. p. 129, pl. cxxiii. fig. 2 (1884).

Depth of body $3\frac{3}{4}$ to $4\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$ to 5. Snout as long as or a little shorter than eye, the diameter of which is 4 to $4\frac{1}{2}$ in the length of head; interorbital width $3\frac{1}{2}$ to $3\frac{2}{3}$ in the length of head. Jaws equal anteriorly; maxillary extending to below anterior $\frac{1}{3}$ of eye or beyond, its length $\frac{2}{3}$ to $\frac{1}{2}$ the length of head. 22 to 26 gill-rakers on the lower part of anterior arch. 74 to 86 scales in a longitudinal series, 8 to 10 in a transverse series from origin of dorsal fin to lateral line, $7\frac{1}{2}$ to 9 between lateral line and base

of pelvic fin, 19 to 22 round the caudal peduncle. Dorsal fin with 9 to 11 branched rays, its origin nearer to end of snout than to base of caudal fin; longest ray about $\frac{2}{3}$ the length of head. Anal with 8 to 11 branched rays. Pectoral extending about $\frac{1}{2}$ the distance from its base to that of the pelvics, which are inserted below or a little in advance of the middle of the dorsal. Caudal peduncle $1\frac{1}{2}$ to $2\frac{1}{2}$ as long as deep, its least depth from less than $\frac{1}{2}$ to nearly $\frac{2}{3}$ the length of head. Silvery, back darker; dorsal and caudal blackish; pelvics and anal usually blackish, except at the base; pectoral usually blackish at the tip.

Lough Neagh, Ulster, Ireland.

Thirty-five examples, 180 to 260 mm. in total length.

Dr. Scharff has kindly sent me on loan a specimen taken in the Estuary of the Foyle, which had no doubt gone down the Bann from Lough Neagh, perhaps during a flood.

Subsp. *a. Coregonus altior*, subsp. n.

THE LOUGH ERNE POLLAN.

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head $4\frac{2}{3}$ to 5. Snout as long as or longer than eye, the diameter of which is $4\frac{1}{2}$ to $5\frac{1}{2}$ in the length of head; interorbital width 3 to $3\frac{1}{2}$ in the length of head. Jaws equal anteriorly; maxillary extending to below anterior $\frac{1}{2}$ or anterior $\frac{1}{3}$ of eye, its length from a little more than $\frac{1}{2}$ to a little less than $\frac{1}{3}$ the length of head. 24 to 26 gill-rakers on the lower part of the anterior arch. 74 to 88 scales in a longitudinal series, 9 or 10 in a transverse series from origin of dorsal fin to lateral line, $8\frac{1}{2}$ to 10 between lateral line and base of pelvic fin, 21 to 24 round the caudal peduncle. Dorsal with 9 or 10 branched rays, its origin usually nearer to end of snout than to base of caudal; longest ray about $\frac{2}{3}$ the length of head. Anal with 8 to 10 branched rays. Pectoral extending about $\frac{1}{2}$ of the distance from its base to that of the pelvics, which are inserted below the middle of the dorsal. Caudal peduncle $1\frac{1}{4}$ to $1\frac{1}{2}$ as long as deep, its least depth from a little more than $\frac{1}{2}$ to a little less than $\frac{1}{3}$ the length of head. Coloration as in *C. pollan*.

Lough Erne, Fermanagh, Ireland.

Fourteen spirit-specimens, 230 to 330 mm. in total length, presented during the last three years by Major H. Trevelyan, and two skins from Thompson's collection, received on loan from the Belfast Museum.

Of these sixteen examples thirteen have 9 scales between the lateral line and the base of the pelvic fin.

Although not so abundant as the Pollan in Lough Neagh, this form is fairly plentiful, and I am informed by Major Trevelyan that it has been netted for the market for some years, fetching 10d. per lb. in England and 8d. per lb. in Belfast.

Subsp. b. *Coregonus elegans*.

THE SHANNON POLLAN.

Coregonus clupeoides (non Lacop.), Thompson, Ann. & Mag. Nat. Hist. ii. 1839, pp. 266 & 421, pl. xvi. fig. 4.
Coregonus elegans, Thompson, t. o. p. 422.

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$ to 5. Snout as long as or longer than eye, the diameter of which is $4\frac{1}{2}$ to 6 in the length of head; interorbital width 3 to $3\frac{1}{2}$ in the length of head. Jaws equal anteriorly; maxillary extending to below anterior $\frac{1}{2}$ of eye, its length $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. 24 to 28 gill-rakers on the lower part of the anterior arch. 78 to 92 scales in a longitudinal series, 9 to 11 in a transverse series from origin of dorsal fin to lateral line, 8 to 10 between lateral line and base of pelvic fin, 22 to 26 round the caudal peduncle. Dorsal with 10 or 11 branched rays, its origin nearer to end of snout than to base of caudal fin; longest ray about $\frac{2}{3}$ the length of head. Anal with 8 to 10 branched rays. Pectoral extending $\frac{1}{2}$ or a little less than $\frac{1}{3}$ of the distance from its base to that of the pelvics, which are inserted below the middle of the dorsal. Caudal peduncle $1\frac{1}{4}$ to $1\frac{2}{3}$ as long as deep, its least depth from a little more than $\frac{1}{3}$ to a little less than $\frac{1}{2}$ the length of head. Coloration as in *C. pollan*.

Lakes of the Shannon System, Ireland.

Eleven specimens from Loughs Ree and Derg, 210 to 360 mm. in total length—one a dried skin, the only one of Thompson's examples of this form which has been preserved, lent by the Belfast Museum; one received on loan from the Dublin Museum; the others recently acquired from Mr. Frank Browne (five), Mr. E. W. L. Holt (presented two), and Harrod's Ltd. (presented two).

Of the eleven examples, seven have 10 scales between the lateral line and the base of the pelvic fin, three have 9, and one 8.

This fish is now scarce, but Mr. E. W. L. Holt writes me that it was plentiful in Lough Ree previous to the drainage of the Shannon in 1845-6.

A specimen said, on rather doubtful authority, to have come from Lough Corrib is in every way similar to those from the Shannon.

According to some of my correspondents, Pollan are found in the Lakes of Killarney, but they have not been able to send me any, and it is possible that Shad have been mistaken for them. Mr. E. W. L. Holt writes me that he tried the lake with suitable nets, but got no Pollan, and he does not think there are any there. Day (Fish. Britain, ii. p. 129) says that in 1852 a Mr. Ffennell exhibited specimens of Pollan from Lough Neagh and from Killarney to the Dublin Natural History Society. I am indebted to Mr. A. R. Nichols for the original report of this exhibition, which appeared in 'Saunders's News-Letters,' Tuesday, June 15, 1852, and which reads as follows:—"The usual monthly meeting was held on Thursday [June 10th];—Mr. Ffennell produced specimens of the Pollan taken in November, 1851, in Lough Neagh and some taken in Killarney the 8th May last and observed on the difficulty of touching them without removing the scales. He directed the attention of the meeting to the difference in shape of the head and gill-cover of the specimens from the two localities."

3. *Coregonus clupeoides*.

THE POWAN.

Coregonus clupeoides, Lacep. Hist. Nat. Poiss. v. p. 698 (1808).

Coregonus cepedianus, Parnell, Ann. & Mag. Nat. Hist. i. 1838, p. 162, fig.

Coregonus microcephalus, Parnell, t. c. p. 163, fig.

Coregonus clupeoides (part.), Günth. Cat. Fish. vi. p. 188 (1866); Day, Fish. Britain, ii. p. 127 (1884).

Depth of body $4\frac{1}{2}$ to $4\frac{3}{4}$ in the length, length of head $4\frac{1}{2}$ to $4\frac{3}{4}$. Snout as long as or a little longer than eye, the diameter of which is $4\frac{1}{2}$ to $4\frac{3}{4}$ in the length of head; interorbital width $3\frac{1}{2}$ to $3\frac{3}{4}$ in the length of head. Snout vertically truncated, with the lower jaw included within the upper; maxillary extending to the vertical from the anterior edge of eye, its length $\frac{1}{2}$ or a little more than $\frac{1}{2}$ the length of head. 20 or 21 gill-rakers on the lower part of the anterior arch. 76 to 84 scales in a longitudinal series, 8 or 9 in a transverse series from origin of dorsal fin to lateral line, $7\frac{1}{2}$ to $8\frac{1}{2}$ between lateral line and base of pelvic fin, 20 or 21 round the caudal peduncle. Dorsal fin with 9 to 11 branched rays; origin nearer to end of snout than to base of caudal fin; longest ray $\frac{2}{3}$ to $\frac{3}{4}$ the length of head. Anal with 9 to 11 branched rays. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ the length of head, ex-

tending from a little more than $\frac{1}{2}$ to $\frac{3}{5}$ of the distance from its base to the pelvics, which are inserted below or in advance of the middle of dorsal. Caudal peduncle $1\frac{3}{5}$ to $1\frac{1}{4}$ as long as deep, its least depth $\frac{1}{3}$ or a little more than $\frac{1}{3}$ the length of head. Silvery, back darker; fins blackish.

Loch Lomond, Scotland.

Two spirit-specimens, 280 and 300 mm. in total length, recently presented by Mr. W. L. Calderwood, and sixteen skins from Dr. Parnell's collection.

Of these eighteen examples, four have 9 branched rays in the anal fin, seven 10, and seven 11.

Subsp. a. *Coregonus stigmatus*, subsp. n.

THE SCHELLY.

Coregonus clupeoides (part.), Günth. Cat. Fish. vi. p. 188, fig. (1866); Day, Fish. Britain, ii. p. 127 (1884).

Depth of body $3\frac{1}{2}$ to $4\frac{1}{2}$ in the length, length of head $4\frac{1}{4}$ to $4\frac{3}{4}$. Snout as long as or a little longer than eye, the diameter of which is $4\frac{1}{2}$ to $4\frac{3}{4}$ in the length of head; interorbital width 3 to $3\frac{1}{2}$ in the length of head. Snout vertically truncated, with the lower jaw included within the upper; maxillary extending to the vertical from anterior edge of eye, its length about $\frac{1}{4}$ the length of head. 22 to 28 gill-rakers on the lower part of the anterior arch. 72 to 86 scales in a longitudinal series, 9 or 10 in a transverse series from origin of dorsal fin to lateral line, 7 to $8\frac{1}{2}$ between lateral line and base of pelvic fin, 22 to 24 round the caudal peduncle. Dorsal fin with 9 to 11 branched rays; origin nearer to end of snout than to base of caudal fin; longest ray $\frac{1}{4}$ to $\frac{1}{3}$ the length of head. Anal with 10 to 12 branched rays. Pectoral $\frac{2}{3}$ to $\frac{7}{8}$ the length of head, extending from a little more than $\frac{1}{2}$ to more than $\frac{2}{3}$ of the distance from its base to the base of pelvics, which are inserted below the middle of the dorsal. Caudal peduncle longer than deep, its least depth $\frac{1}{3}$ to $\frac{1}{2}$ the length of head. Silvery, back darker; back and sides with more or less distinct small blackish spots; similar spots sometimes present on the head and in transverse series on the dorsal and caudal fins; fins blackish.

Hab. Haweswater, Cumberland, and Ullswater, Westmoreland.

Twelve spirit-specimens, 220 to 340 mm. in total length, several of which have been recently presented by the Earl of Lonsdale, and a skin from Yarrell's collection.

Of these thirteen examples, ten have 10 branched rays in the anal fin, two 11, and one 12; seven have 8 scales

between the lateral line and the base of the pelvic fin, four $7\frac{1}{2}$, one 7, and one $8\frac{1}{2}$.

Subsp. b. *Coregonus pennantii*.

THE GWYNIAD.

Coregonus pennantii, Cuv. & Val. Hist. Nat. Poiss. xxi. p. 507 (1848).
Coregonus clupeoides (part.), Günth. Cat. Fish. vi. p. 188 (1866);
 Day, Fish. Britain, ii. p. 127, pl. cxxii. (1884).

Depth of body $3\frac{3}{8}$ to $4\frac{1}{4}$ in the length, length of head $4\frac{1}{2}$ to 5. Snout nearly as long as or a little longer than eye, the diameter of which is $3\frac{3}{8}$ to $5\frac{1}{2}$ in the length of head; interorbital width $3\frac{1}{3}$ to $3\frac{2}{3}$ in the length of head. Snout vertically truncated, with the lower jaw included within the upper; maxillary extending to or a little beyond the vertical from the anterior edge of eye; 21 to 23 gill-rakers on the lower part of the anterior arch. 76 to 90 scales in a longitudinal series, 9 or 10 in a transverse series from origin of dorsal fin to lateral line, 8 to 10 between lateral line and base of pelvic fin, 22 to 24 round the caudal peduncle. Dorsal fin with 10 branched rays; origin nearer to end of snout than to base of caudal fin; longest ray $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. Anal with 11 to 13 branched rays. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ the length of head, extending from a little more than $\frac{1}{2}$ to a little less than $\frac{2}{3}$ of the distance from its base to that of the pelvics, which are inserted below the middle of the dorsal. Caudal peduncle longer than deep, its least depth $\frac{1}{3}$ or a little more than $\frac{1}{3}$ the length of head. Silvery, back darker; fins blackish.

Lake Bala, Merionethshire.

Six spirit-specimens, 210 to 400 mm. in total length, four of which have been recently presented by Sir Watkin Wynn and Mr. William Owen, and a skin from Jardine's collection.

Of these seven examples, four have 11 branched rays in the anal fin, two 12, and one 13; five have 9 scales between the lateral line and the base of the pelvic fin, one 8, and one 10.

4. *Coregonus oxyrhynchus*, Linn.

THE HOUTING.

Coregonus oxyrhynchus, Günth. Cat. Fish. vi. p. 183 (1866); Day, Fish. Britain, p. 126, pl. cxxi. fig. 2 (1884).

Hab. Coasts and rivers of Europe from Scandinavia to Holland.

This species attains a length of 400 mm. and is often seen on the London market; Day records it from Lincolnshire, the Medway, and Chichester.

LXIII.—*A new Squirrel from Burmah.*

By R. C. WROUGHTON.

THE Natural-History Museum has recently received from Capt. A. W. Kemmis, Burma Military Police, a specimen of a squirrel so distinct in coloration from any other known form that I think it deserves to be described and named.

Sciurus kemmisi, sp. n.

A squirrel about the size of *S. haringtoni*, Thos., or *S. blanfordi*, Blyth, remarkable on account of the bright colouring of its face.

Size as in *S. blanfordi*. Fur close, of medium length; on the back, underfur 14–18 mm., longer hairs 25 mm. General colour above "olive," finely grizzled with buffy; individual hairs of underfur "blackish slate" at their bases for one-third their length, then black with a narrow subterminal whitish ring; longer hairs black, with three pale buff rings 3–4 mm. wide dividing whole length into four black sections, each 4–5 mm.; below bright "orange-rufous." Face, as far as back of eyes, throat, feet, and hands "orange-rufous," like the belly. Tail finely banded black and buffy for most of its length, individual hairs 40–45 mm. long, pale buff, with six evenly placed black rings, each 4–5 mm. wide; colouring of back above and belly below extending for only a very short distance (35 mm.) along the tail. Tip of tail coloured entirely bright "bay."

Dimensions (from a dried skin):—

Head and body (c.) 250 mm.; tail (c.) 235; hind foot 46; ear 18.

Hab. Katha, Upper Irrawadi.

Type. Adult female. B.M. no. 8. 8. 17. 3.

This very distinct and handsome species, which I have much pleasure in naming after its collector, is probably most nearly related to *S. blanfordi* and *S. haringtoni*. In both these species the belly-colour is found extending on to the feet and hands, but neither of them shows any trace of its extension to the face, which is such a marked feature in the present species. This character and the bay tail-tip serve to distinguish *S. kemmisi* at a glance from any other species.

LXIV.—*Diagnoses of new Fishes from the Upper Zambesi.*
By G. A. BOULENGER, F.R.S.

IN the September number of these 'Annals' I had the privilege of giving diagnoses of 12 new fishes from Lake Nyassa. A further advance has since been made in our knowledge of the fishes of the Zambesi System through the exertion of Mr. T. Codrington, who on a recent visit to his son, Mr. R. Codrington, Administrator of N.W. Rhodesia, availed himself of the exceptional facilities afforded him to make a very valuable collection of the fishes, which he has presented to the British Museum. Seven species are considered to be new and are here briefly characterized. Further descriptions and figures of these will appear in the British Museum 'Catalogue of African Freshwater Fishes,' now in course of preparation.

Barbus victorice.

D. IV 8. A. III 5. L. lat. 30. L. tr. $\frac{5}{4}$.

Depth of body 3 times in total length, length of head $4\frac{1}{2}$ times. Snout rounded, 3 times in length of head, eye 5 times, interorbital width $2\frac{1}{2}$ times; mouth inferior, its width 3 times in length of head; lower jaw with a nearly straight sharp edge, covered with a thin horny sheath; lips rather thick, papillose, lower restricted to the sides; barbels 2 on each side, anterior $\frac{1}{3}$, posterior $\frac{1}{3}$ diameter of eye. Last simple ray of dorsal not enlarged, flexible, smooth, $1\frac{1}{2}$ length of head; border of dorsal concave. Anal nearly reaching caudal. Base of ventral below middle of dorsal. Caudal peduncle as long as deep. $2\frac{1}{2}$ scales between lateral line and ventral, 12 round caudal peduncle. Pinkish brown above, each scale blackish at the base, pinkish white beneath; fin dark grey.

Total length 320 mm.

A single specimen, from the gorge below the Victoria Falls.

Barbus codringtonii.

D. III 9. A. III 5. L. lat. 32. L. tr. $\frac{4}{3}$.

Depth of body $3\frac{1}{2}$ times in total length, length of head 4 times. Snout rounded, $3\frac{1}{2}$ times in length of head, eye 6 times, interorbital width $2\frac{1}{2}$ times; mouth inferior, its width 3 times in length of head; lips moderate, lower broadly interrupted on the chin; barbels 2 on each side, anterior $\frac{1}{3}$,

Fishes from the Upper Zambezi.

posterior $\frac{2}{3}$ diameter of eye. Last simple ray of dorsal not enlarged, flexible, smooth, $1\frac{1}{2}$ length of head; border of dorsal concave. Anal reaching caudal. Base of ventral below middle of dorsal. Caudal peduncle slightly longer than deep. 2 scales between lateral line and ventral, 12 round caudal peduncle. Brown above, the scales blackish at the base, pink on the sides, white beneath; dorsal and ventrals yellow.

Total length 390 mm.

A single specimen from the Zambezi above the Victoria Falls.

Barbus fairbairnii.

D. III 8. A. III 5. L. lat. 34. L. tr. $\frac{5}{4}$.

Depth of body 3 times in total length, length of head 4 times. Snout obtusely pointed, covered with horny tubercles on tip and sides, 3 times in length of head, eye $5\frac{1}{2}$ times, interorbital width $2\frac{1}{2}$ times; mouth inferior, its width $3\frac{1}{2}$ times in length of head; lips moderately thick, lower restricted to the sides; barbels 2 on each side, equal, $\frac{1}{2}$ diameter of eye. Last simple ray of dorsal not enlarged, flexible, smooth, as long as head; border of dorsal straight. Anal reaching caudal. Base of ventral below middle of dorsal. Caudal peduncle $1\frac{1}{2}$ times as long as deep. 2 $\frac{1}{2}$ scales between lateral line and ventral, 12 round caudal peduncle. Purplish brown above, pinkish white beneath, the scales blackish at the base; fins purplish brown.

Total length 420 mm.

A single specimen, captured by Mr. Fairbairn in the gorge below Victoria Falls along with the *B. victoriae* described above.

Barbus altidorsalis.

D. III 9. A. III 5. L. lat. 28. L. tr. $\frac{4}{3}$.

Depth of body 3 times in total length, length of head $4\frac{1}{2}$ times. Snout rounded, $3\frac{1}{2}$ times in length of head, eye 5 times, interorbital width $2\frac{1}{2}$ times; mouth inferior, its width 3 times in length of head; lips thick, continuous across the chin; barbels 2 on each side, equal, $\frac{1}{2}$ diameter of eye. Last simple ray of dorsal not enlarged, flexible, smooth, anterior branched rays also much elongate, $1\frac{1}{2}$ length of head, the fin deeply notched behind the third branched ray. Anal reaching beyond base of caudal. Base of ventral below middle of dorsal. Caudal peduncle $1\frac{1}{2}$ times as long as deep.

2 scales between lateral line and ventral, 12 round caudal peduncle. Brownish above, the scales darker at the base, pink on the sides, white beneath; fins yellow, blackish towards the edge.

Total length 360 mm.

A single specimen from the Kafue River, 250 miles from Victoria Falls.

Barbus chilotes.

D. III 9-10. A. III 5. L. lat. 30-32. L. tr. $\frac{4}{11}$.

Depth of body $3\frac{1}{2}$ times in total length, length of head 4 or $4\frac{1}{2}$ times. Snout rounded, about 3 times in length of head, eye $3\frac{1}{2}$ to 5 times, interorbital width $2\frac{1}{2}$ to $2\frac{3}{4}$ times; mouth inferior, its width $3\frac{1}{2}$ to 4 times in length of head; both lips much developed, each more or less produced into an obtusely pointed median lobe; barbels 2 on each side, posterior nearly twice as long as anterior and a little shorter than eye. Last simple ray of dorsal not enlarged, flexible, smooth, $1\frac{1}{2}$ length of head; border of dorsal concave. Anal reaching or nearly reaching caudal. Base of ventral below middle of dorsal. Caudal peduncle $1\frac{1}{2}$ times as long as deep. 2 or $2\frac{1}{2}$ scales between lateral line and ventral, 12 round caudal peduncle. Pinkish brown above, the scales edged with blackish, white beneath; fins dark grey.

Two specimens, 145 and 235 mm. long, from the Maramba River, a tributary of the Zambezi two miles above the Falls.

Paratilapia kafuensis.

D. XVI 15. A. III 12. Sq. $38\frac{7}{12}$. L. lat. $\frac{20}{18}$.

Depth of body $2\frac{2}{3}$ times in total length, length of head $2\frac{2}{3}$ times. Head strongly compressed, with concave upper profile; eye 5 times in length of head, $1\frac{1}{2}$ times in length of snout; maxillary extending to below anterior fourth of eye; chin projecting; teeth very small, in 4 series; 8 series of scales on the cheek; 12 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures $\frac{1}{3}$ length of head. Pectoral $\frac{3}{4}$ length of head. Caudal fin rounded. Caudal peduncle a little longer than deep. Scales not denticulate. Pale brownish above, white below, dotted and marbled with dark brown; a dark oblique band from the eye to the maxillary; a black opercular spot; dorsal and anal with round blackish spots.

Total length 240 mm.

A single specimen from the Kafue River

Paratilapia codringtonii.

D. XV 14-15. A. III 10. Sq. 35-36 $\frac{4}{12}$. L. lat. $\frac{21-24}{14-16}$.

Depth of body twice, or a little less than twice, in total length, length of head 3 to $3\frac{1}{2}$ times. Eye 5 times in length of head, $1\frac{1}{3}$ times in length of snout; maxillary not extending to below anterior border of eye; jaws equal in front; teeth in 3 series, outer rather large; 4 or 5 series of scales on the cheek; 11 or 12 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures a little more than $\frac{1}{3}$ length of head; soft dorsal and anal acutely pointed. Pectoral a little shorter than head. Caudal peduncle much deeper than long. Scales not denticulate. Brownish, darker on the back, the scales lighter in the centre, a black opercular spot; dorsal purplish, edged with orange; ventrals purplish; anal and caudal orange.

Total length 300 mm.

Three specimens from the Zambesi above Victoria Falls.

LXV.—*A new Pogonomys presented to the British Museum by Sir William Ingram.* By OLDFIELD THOMAS.

IN a collection of mammals obtained by Mr. W. Stahnke while on the recent successful expedition sent out by Sir William Ingram in search of living paradise-birds there occur a number of specimens of the following new species of *Pogonomys*:—

Pogonomys vates, sp. n.

Near *P. lamia*, Thos., but colour redder and teeth smaller.

Size medium. Fur soft and woolly, about 8 mm. in length on the back. General colour above greyish ochraceous buff or rufous, darkened on the back, clearer and more rufous on the sides. Under surface pure white, the hairs white to their bases. Muzzle rather lighter buffy. Whiskers very long and numerous, 6-7 cm. in length. Eyes with a narrow blackish rim. Ears naked, grey, fairly long, laid forward in a spirit-specimen they reach to the centre of the eye, narrowly oval, more or less pointed; in *P. lepidus* they are shorter, with more or less truncated ends. Outer sides of arms and legs like body, inner sides white; hands and feet almost naked, the sparse fine hairs white. Tail long, coarsely and roughly scaled, with a fair number of minute hairs on it,

although, of course, far more naked than in an average *Mus*; on the other hand, in *P. lepidus* the tail is smooth and hairless, as in *Uromys*.

Skull very much as in *P. lamia*, except that the zygomatica are not so remarkably expanded outwards anteriorly, but are of normal expansion; nasals rather narrower; palatal foramina even more narrow and contracted, contrasting with the more open ones of *P. lepidus*. Teeth of similar structure, but markedly smaller, quite unusually small in proportion to the size of the skull.

Dimensions of the type (measured in the flesh) :—

Head and body 120 mm.; tail 183; hind foot 25; ear 16.

Skull: greatest length 31·6; basilar length 25·5; zygomatic breadth 18; interorbital breadth 4·7; palatilar length 13·7; diastema 9; palatal foramina 4·2 × 1·5; upper molar series 4·6.

Hab. Madeu, Upper St. Joseph's R., about 50 miles N.E. of Hall Sound, British New Guinea. Alt. 2000–3000'.

Type. Old female. B.M. no. 8. 10. 8. 7. Original number 585. Collected June 1908 by W. Stalker. Presented by Sir William Ingram, Bart.

This species is most closely allied to *P. lamia*, Thos., but is readily distinguishable by the more normal expansion of its zygomatica and its smaller teeth.

Mr. Stalker obtained together a large number of specimens of this and *P. lepidus*, which he did not distinguish from each other, and which are, indeed, so remarkably alike externally that it needs a close examination of their tails and ears to separate them. Their size, proportions, and colour are quite the same, but *P. vates* has a coarse-scaled tail with a certain amount of hairs on it, so that it feels rough to a hand passed along it from tip towards body, while the tail of *P. lepidus* has smooth close-set scales without hairs, and feels equally smooth whichever way it is stroked.

LXVI.—A new Akodon from Tierra del Fuego.

By OLDFIELD THOMAS.

FROM our generous correspondent Mr. J. A. Wolffsohn, of Valparaiso, we have recently received a tuco-tuco and a mouse obtained by Dr. France in Tierra del Fuego. The former may be referred to *Ctenomys fueginus*, Phil., but the latter appears to be new, and may be called

Akodon francesi, sp. n.

A dark-coloured species of the long-skulled *A. longipilis* group. Size rather less than in *A. longipilis*. Fur close and fine, not excessively long considering that the specimen is a winter one from the far south; hairs of back about 10-11 mm. in length. General colour above slaty grey (grey no. 4 of Ridgway), the middle dorsal area slightly tinged with buffy, owing to the hairs having very narrow subterminal buffy bands on them. In the allied species *A. longipilis*, *hirtus*, and *suffusus* the bands are much broader and the general colour of the whole upper surface is therefore more strongly buffy. Head, neck, and sides nearly pure slaty grey. Under surface white, the hairs slaty basally, with white tips, the line of demarcation on sides high up and rather sharply defined, so as to give a strongly bicolor aspect to the whole animal. Ears brown. Hands and feet pure white; claws of normal proportions, not elongated as in *Chelemys*. Tail thickly hairy, conspicuously bicolor, sharply defined blackish above, white below.

Skull in general proportions very similar to that of *A. suffusus*, but rather larger and with a longer brain-case. Outer plate of anteorbital foramen rather broader. Supraorbital edges similarly rounded; interparietal minute.

Dimensions of the type (measured by Mr. Wolffsohn before skinning, on the specimen preserved in brine):—

Head and body 116 mm. (probably more in the flesh); tail 80; hind foot 24; ear 13.

Skull: greatest length 30·3; basilar length 23; zygomatic breadth 13·6; nasals 11·5; interorbital breadth 5·2; brain-case breadth 12·5; diastema 8; palatal foramina 6·4; length of upper molar series 4·1.

Hab. Santa Maria, Tierra del Fuego.

Type. Adult male. B.M. no. 8. 11. 19. 1. Original number 283. Collected 26th August, 1908, by Dr. France. Presented by J. A. Wolffsohn, Esq.

This very striking species, which I have had much pleasure in naming after its discoverer, Dr. France, is at once recognizable by its dark olivaceous-grey colour, which contrasts with its white belly and snowy-white feet, all the other three species of the group being of a much paler grey, broadly suffused with buffy. It is most nearly allied to *A. suffusus*, which is similarly bicolor, but far less strongly contrasted, and is no doubt the latter's representative on the south side of the Straits of Magellan.

LXVII.—*The Squirrels described as Sciurus steerii from Balabac and Palawan.* By OLDFIELD THOMAS.

IN 1876 * Dr. Günther described and figured two squirrels collected by Dr. Steere on the islands of Balabac and Palawan as *Sciurus steerii*, he being under the impression that they represented but a single species inhabiting the two islands. Since then, however, a number of these squirrels have come to Europe, and all those from Balabac prove to be precisely identical with Dr. Günther's No. 1, from that island, while all those from Palawan, although considerably more variable, *inter se*, than the Balabac ones, agree in differing from the latter by their browner, less rufous colour, their greyish sides, and black-tipped tail, as described by Dr. Günther under 2. In belly-colour, however, they may be white or either partially or wholly rufous.

This being the case, it is evident that the squirrels from the two islands should be considered as distinct species, and I would propose to restrict the name *S. steerii* to Dr. Günther's No. 1, the foremost figure on his plate, with its type B.M. no. 76. 10. 4. 4, and to assign the name *S. juvencus* to the Palawan species, described by Dr. Günther under No. 2 and drawn in the background of his plate, its type being B.M. no. 76. 10. 4. 3.

With regard to the variation in the belly-colour of *S. juvencus* it is to be noticed that the greatest extremes, all white and all red, are shown by specimens from the same place, Puerto Princesa.

LXVIII.—*Note on the Copepod Genus Oithona.* By G. P. FARRAN, Department of Agriculture and Technical Instruction, Fisheries Branch, Dublin.

IN going through some collections of Copepoda taken by the Department of Agriculture's cruiser 'Helga' off the W. and S.W. coasts of Ireland I have noticed the presence of two species of the genus *Oithona* which at first sight appear to be *O. plumifera* and *O. setigera*, but on a closer examination are seen to possess some minute points of difference from those species. As the local distribution of the members of this

* P. Z. S. 1876, p. 785, pl. lxix.

genus seems to be in great measure influenced by the salinity of the water which they inhabit, and, consequently, their correct determination a matter of importance when they occur in collections of plankton made to show the correlation of biological and hydrographical facts, it seems advisable to call attention to the matter in a preliminary note.

The history of that section of the genus *Oithona* to which *O. plumifera* and *O. setigera* belong, characterized by a long anteriorly directed rostrum visible in dorsal view, is briefly as follows:—In 1843 Baird * briefly described and named as *Oithona plumifera* a copepod taken at the surface in lat. $3^{\circ} 24'$ N., long. $22^{\circ} 7'$ W. The description was accompanied by a rude figure of the animal in dorsal view. The only points which can guide us to a discovery of what the animal really was were the general form of the body, the length, shown as a line 2 mm. long, the length of the first antennæ, almost equal to the body, and the presence of four plumose setæ on either side “ attached to the sides of the insect ” (in reality they are attached to the second basal joints of the swimming-feet).

In 1847 Dana described as *Scribella scriba* a specimen taken by the United States Exploring Expedition; but in 1852, in a further account of the same collection, he withdrew the name *L.*, referred the specimen to *O. plumifera*, Baird. He gave at the same time a short description and a few figures of *O. plumifera*, and also briefly described and figured a second species, *O. setigera*, characterized by the setæ on the second basal joints of the swimming-feet being clavate at their extremities instead of being plumose. Claus, in 1863 and 1866, described and figured, from Messina and Nizza, *O. spinirostris*, which has been generally regarded as synonymous with *O. plumifera*, and which I shall refer to below. In 1864 Boeck † described from the Christiania Fiord, under the name of *O. spinifrons*, a species which several authors (V. Breemen, G. O. Sars) believe to be identical with *O. plumifera*, but which Giesbrecht refers, with a query, to *O. similis*, Claus.

In the ‘Challenger’ Reports, 1883, Brady referred all the specimens of *Oithona* which he met with to a new species, *O. challengeri*. From the figures which he gives it appears to resemble *O. setigera* very closely, as the third joint of the exopodite of the first foot bears three outer-edge spines, the

* ‘Zoologist,’ vol. i. (1843).

† Vid. Selsk. Forhandl. Christiania. I only know this paper through Giesbrecht’s summary in Wiss. Unt. Deutschen Meere (Kiel, 1882).

first maxilla has a moderate seta on the endopodite and the mandible four setæ on the endopodite. The figure of the mandible (pl. xl. fig. 12) is wrongly referred to *Zaus goodsiri* both in the explanation of the plate and the heading to the species in the text, and there is no reference to it in the description of *O. challengeri*. There can be no doubt, however, that it really belongs to *O. challengeri*, as the mandible of *Z. goodsiri* is of a quite different form.

Finally, Giesbrecht, in 1892*, redescribed and figured, for the first time in sufficient detail, both *O. plumifera* and *O. setigera*, the former of which he had met with in collections from the Mediterranean and from the Atlantic, Pacific, and Indian Oceans, and the latter from the Pacific.

He relied for his identification on the presence of plumose or clavate outer-edge setæ on the second basal of the swimming-feet of the respective species.

The following is a brief description of the two species which, in addition to *O. similis* and *O. nana*, occur off the west coast of Ireland. The allusions to *O. plumifera* and *O. setigera* must be taken as referring to Giesbrecht's description of those species.

Oithona atlantica, sp. n.

Female.—Length 1·0–1·16 mm.

Cephalothorax of the same form as in *O. plumifera*, the rostrum being as in that species in dorsal and lateral view. Abdomen five-jointed, the proportional length of the joints and the furca being 8 : 20 : 10 : 9 : 11 : 7. Furcal setæ as in *O. plumifera*.

First antenna reaching almost to the end of the body.

Second antenna as in *O. plumifera*.

Mandible as in *O. plumifera*, except that the endopodite bears four subequal setæ instead of three.

First maxilla as in *O. plumifera*, except that the endopodite bears a seta about three times as long as itself. The second inner lobe is only just indicated and bears no seta.

Second maxilla and maxillipede as in *O. plumifera*.

First foot as in *O. plumifera*, with two outer-edge spines on the third joint of the exopodite; the outer-edge seta of the second basal is, however, more slender and apparently not feathered.

Second and third feet without an inner-edge seta on the first basal joint; the second basal joint has a very slender

* 'Fauna u. Flora Golf. Neapel' (1892).

short outer-edge seta; exopodite and endopodite as in *O. plumifera*.

Fourth foot without an inner-edge seta on the first basal joint; an outer-edge seta on the second basal joint was apparently absent in all the specimens examined; exopodite and endopodite as in *O. plumifera*.

Fifth foot as in *O. plumifera*.

Male unknown.

Distribution. Common off the west and south-west coasts of Ireland, 0-1000 fath. It is usually found in waters of a salinity of 34·8 per mille and over, but has a few times been taken in much less saline water.

Oithona pelagica, sp. n.

Female.—Length 1·36-1·52 mm.

Cephalothorax as in *O. plumifera*, the rostrum being visible in dorsal view as in that species. Abdomen five-jointed, the proportional lengths of the joints and the furca being 11:32:15:15:18:14.

First antenna reaching almost to the end of the body.

Second antenna as in *O. plumifera*.

Mandible as in *O. plumifera*, except that the endopodite bears four subequal setæ.

First maxilla of the same general form as in *O. plumifera*; the endopodite, however, bears a medium-sized seta and the second inner lobe bears a seta which reaches to the end of the third inner lobe. The seta, which is situated at the base of the exopodite in *O. plumifera* and represents the first outer lobe, could not be made out, but may have been overlooked.

Second maxilla and maxillipede as in *O. plumifera*.

First foot as in *O. setigera*, with three outer-edge spines on the third joint of the exopodite; the outer-edge seta of the second basal is, however, very slender and tapered, about equal in length to the terminal spine of the exopodite.

Second to fourth feet each with a very minute inner-edge seta on the second basal. The first basal bears on its outer margin a very slender tapering seta, about equal in length, in the second foot, to the exopodite, but much shorter in the third and fourth feet. Exopodites and endopodites as in *O. plumifera*.

Fifth foot as in *O. plumifera*.

Male unknown.

Distribution. Occurs off the S.W. coast of Ireland in waters of a salinity of 35·4 per mille and over. It has been taken in nets fishing from depths of ca. 500 fathoms to the

surface, but the exact depth at which it occurred could not be ascertained.

It will be seen from the above descriptions that *O. setigera* and *O. pelagica* are at once separable from *O. plumifera* and *O. atlantica* by the possession of three outer-edge spines on the third joint of the exopodite of the first foot, the two latter species possessing only two such spines. The differences between the members of each group are shown in the following table :—

<i>O. plumifera.</i>	<i>O. atlantica.</i>
Length 1·0-1·5 mm.	Length 1·0-1·18 mm.
Endopodite of mandible with three setæ.	Endopodite of mandible with four setæ.
Endopodite of first maxilla with minute seta.	Endopodite of first maxilla with moderate seta.
Outer-edge seta on second basal of first to fourth feet very long, strong, feathered on first to third, smooth on fourth.	Outer-edge seta on second basal of first to third feet very slender, smooth, absent on fourth foot.
Short smooth seta on inner edge of second basal of second to fourth feet.	No seta on inner edge of second basal of second to fourth feet.
<i>O. setigera.</i>	<i>O. pelagica.</i>
Length 1·5-1·6 mm.	Length 1·36-1·52 mm.
Outer-edge seta on second basal of first to fourth feet stout, clavate at end.	Outer-edge seta on second basal of first to fourth feet very slender, tapered.

Thus, while *O. plumifera* and *O. atlantica* are separated by several small points of difference, the distinction between *O. setigera* and *O. pelagica* lies only in the presence of clavate or tapered setæ on the basals of the swimming-feet. Possibly this distinction may be regarded by some as insignificant; but until it is shown that the two varieties of setæ can occur in specimens from all localities, it ought not to be disregarded.

It is very probable that both *O. atlantica* and *O. pelagica* have been already described, but it is difficult to discover under what name. Boeck, in his description of *O. spinifrons*, does not mention any point which is not common to both species, and his name must accordingly lapse for uncertainty. Claus, in describing *O. spinirostris*, does not mention the number of outer-edge spines on the exopodite of the first foot, but in his figure of the first maxilla he shows a moderately long seta on the endopodite and a seta on the second inner lobe. This last character makes it probable that he refers either to *O. setigera* or *O. pelagica* (if either of

these species occur in the Mediterranean), but the probability is too slight to permit the use of his name. As far as Brady's description of *O. challengerii* goes it is applicable to both *O. setigera* and *O. pelagica*; but the absence of any reference to or figure of the outer-edge setæ of the basipodites of the swimming-feet prevents a definite conclusion being reached.

With regard to recent records of *O. plumifera* and *O. setigera*, we find in the 'Quarterly Bulletins of the International Council for the Investigation of the Sea' that *O. plumifera* occurs in the plankton lists of Denmark, Norway, Sweden, Holland, Germany, Russia, England, and Ireland. The Irish records, for which I am responsible, refer to the species described above as *O. atlantica*, as do likewise the records in the various papers in the 'Reports on the Sea and Inland Fisheries of Ireland.' The quarterly plankton lists of Scotland contain both *O. setigera* and, more rarely, *O. plumifera*, and Dr. T. Scott * has recorded *O. setigera* from the Firth of Forth and from off Shetland. It seems probable that some, at any rate, of these records refer to one or other of the species described above; and even if the points which I have relied on in separating the species should be regarded as of varietal rather than of specific rank, it is still incumbent on those who record the species for statistical purposes to indicate which variety is referred to.

LXIX.—On Two new Genera of Recent Pharetronid Sponges. By R. KIRKPATRICK.

[Plates XIII.-XV.]

WHEN looking through some material in a large bottle mostly containing pieces of *Stylaster sanguineus*, obtained by the 'Challenger' from a depth of 70 fathoms off Api, New Hebrides, I came across two specimens which at first sight looked like pieces of *Millepora*. A closer inspection, however, showed them to be Lithonine sponges, and of great interest, because the soft tissues have been fairly well preserved. The sponges belong to a new genus and species, which I propose to name *Minchinella* † *lamellosa*. A second new genus must be established to include certain sponges

* 'Ninth Ann. Rep. F. B. Scotland' (1891); 'Twentieth Ann. Rep. F. B. Scotland' (1902).

† Named in honour of Prof. E. A. Minchin, M.A., Professor of Protozoology in the University of London.

recently sent to me by Canon Norman. The specimens are in the form of small thin crusts on fragments of débris which formed part of an agglomerated mass of shells, calcareous algæ, worm-tubes, &c. brought up from 60 fathoms off Porto Santo Island, near Madeira. I propose to name the new genus and species *Merlia normani**[†], and to place them in a new subfamily, *Merlinæ*, next to the subfamily *Lithoninæ*.

I have to thank Dr. G. J. Hinde, F.R.S., for his kindness in lending me a section of *Petrostroma schulzei* Doderlein.

MINCHINELLA, gen. nov.

Lamellar Lithoninæ with pore-chimneys on one side and oscular chimneys on the other, each with a skeleton of monaxons, triradiates, and quadriradiates; main skeletal framework formed of large quadriradiates cemented together. Canal system leuconoid.

Minchinella lamellosa, sp. n.

The larger of the two specimens of this species (specimen A) is in the form of a thick, firm, flabelliform lamella, undulating slightly from side to side and expanding upwards from a narrow base of attachment 1·8 cm. long, which has evidently been broken off from the rocks; the margin of the lamella is thick and rounded. The specimen is 6·4 cm. wide, 5·1 cm. high, and 6·5 mm. thick. The colour in alcohol varies from pale buff to brown, but is almost white at the rim.

The surface of the sponge is incrusted with numerous small colonies and patches of Tunicates, Polyzoa, worm-tubes, barnacles, and other sponges.

The poral surface is beset with poral chimneys, those near the base and centre being longer and larger than the younger ones near the periphery, which gradually become flush with the surface; at the margin itself the dermal membrane forms a roof over branching furrows, and the pores are not segregated into areas, though at a later stage the pore-chimneys will grow up from the furrows.

The tallest chimneys are about 3 mm. in height and 1 mm. in diameter; they are curved, with the convexity towards the periphery; further, they are narrow at the waist, and expand towards the summit; at the upper end is the pore-area in form of a drum-like membrane with a fringe of fine monaxon bristles round the edge. The upper four-fifths of the chimney is easily broken off, leaving a circular hole slightly raised above the general surface.

* Named in honour of Canon Alfred Merle Norman, M.A., D.C.L.
† *See Fig. 2*

The oscular surface is covered with numerous oscular beehive-shaped or cylindrical chimneys, with a very contracted orifice at the summit; the height is about 2 mm. Only a few remain intact, most having been knocked off or squashed inside the hard cylindrical bases, which rise up about .5 mm. above the surface; the youngest oscules at the periphery lie along the course of grooves and are flush with the surface.

The smaller specimen (B) is in the form of an ear-shaped lamella with the poral surface on the concave side; the breadth is 3.5 cm., the height 3 cm., and thickness 5 mm.

The poral surface is covered with a soft, fleshy, ectosomal, umber-coloured layer, whence the low densely crowded pore-chimneys arise; the oscular surface is lighter in colour, and the ectosome is barely discernible excepting along certain peripheral grooves.

The outward appearance of *Minchinella* closely resembles that of species of the fossil Pharetronid genus *Rhaphidonema* Hinde (2, p. 97).

The fractured surface of the sponge is of a pale cream-colour, and, excepting for the larger incurrent and excurrent canals, homogeneous in aspect. Under a lens a fine reticulum can be made out; in a transparent vertical section the network is seen to be denser externally than at the centre.

The Canal System.—The canal system is well shown in stained vertical sections of decalcified sponge, and also by tracing out with a needle the course of the larger incurrent canals seen on the broken surface of a dried macerated fragment.

The oscules open below into wide excurrent canals, which give off a series of smaller canals; the latter, by branching and anastomosis, form a tubular network, often with quite regular rectangular meshes and with terminal blind branches. The tubular strands, but more especially the nodes, are beset with spheroidal flagellated chambers 32.5μ in diameter. The breadth of the strands averages about 40μ , and of the nodes 52μ , but the soft tissues have been much contracted in preparation.

The collar cells are large, with a flattened body containing a very large nucleus nearly filling the cell.

Viewed in optical vertical section, the body of the cell is low, mound-shaped, resembling in this aspect Hexactinellid collar cells figured by Ijima (3 a, pl. v, figs. 40, 41); the base has a circular outline and the nucleus is always seen at the side of the cell. The collar forms a long slender funnel arising from a point situated a little eccentrically. The flagellum is clearly visible outside the collar, but I could not trace it down inside. Prof. Minchin, to whom I showed the

sections, considered that the collar cells had a "Leucosolenid" rather than a "Clathrinid" aspect; as he has pointed out, the flagellum arises from the terminally situated nucleus in *Leucosolenia*, but in *Clathrina* from a granule separated a long way from the basally situated nucleus. It may be mentioned here, too, that the sagittal spicules of *Minchinella* suggest Leucosolenid affinities. The dimensions of the collar cells are as follows:—total height $19\ \mu$; collar $14.5\ \mu$ high; body of cell $4.5\ \mu$; diameter of base $5.28\ \mu$. The cells vary in size, the figured ones (Pl. XIII. fig. 8) being the largest.

In the spaces between the collar cells are the pore cells with funnel-shaped apertures, the narrow opening of the funnel being, as usual, external.

Skeleton.—On both surfaces of the sponge there is an ectosomal layer of more or less fusiform spined microxeas, longer and more slender on the oscular than on the poral surface. These spicules form a thick outer coat on the poral and oscular chimneys, and are described along with the other spicules of those structures. The skeleton of the poral and oscular chimneys is constructed of triradiates, quadriradiates, and monaxons. As a rule, there are several layers of triradiates, with the odd ray passing downwards and with the paired rays encircling the tube; the quadriradiates have the gastral ray projecting into the lumen of the chimneys, and the monaxons are arranged as an external pile with the axes vertical or oblique to the long axis of the tube; there is a fringe of bristle-like monaxons round the poral orifice. At the bases of the poral and oscular chimneys three-rayed and four-rayed spicules with thick spined rays become cemented together, but are not yet completely enveloped by that material. Lastly, there is the firm framework of quadriradiates completely enveloped in cement.

Poral Spicules.—(1) Triradiates (Pl. XIV. fig. 4), with thick, slightly curved, gradually tapering, rather blunt-pointed rays; unpaired ray longer than the paired and curving backwards a little from the facial plane; angle between the paired rays 150° . Unpaired ray $156\ \mu$ long, $9.5\ \mu$ thick at base; paired ray $87\ \mu$ long.

(2) Quadriradiates (Pl. XIV. figs. 1, 2, 3), of the same general character as (1), but with longer basal rays; gastral ray $17\ \mu$ long, sharp-pointed, curved upwards. A different kind (Pl. XIV. fig. 3) has nearly equal basal rays, the odd one being spined, and a much longer gastral ray; these were found at the base of the soft part of the pore-chimney and near the outer wall of the tube, so that the gastral ray traversed nearly the whole thickness of the wall.

(3) Monaxons. Three kinds: (a) (Pl. XIV. fig. 7) forming a thick pile on the surface of the chimney, and arranged vertically to the long axis or pointing obliquely upwards; the spicules are straight, anisoactinate, thick and spined in proximal half, but tapering gradually to a fine, smooth, bayonet end, 87μ long, 7.5μ thick. (b) (Pl. XIV. fig. 8) a longer kind, straight, smooth or strongly spined, with distal bayonet end, 234μ long, 3.8μ thick, situated at upper end of pore-chimney. (c) Very slender fringe spicules (Pl. XIV. fig. 9), long, curved, and with very fine distal end.

(4) Tuning-forks (Pl. XIV. figs. 5, 6) in the hard basal part of the pore-chimney. The shaft is smooth and with a club-shaped proximal end, the length being 133μ ; the prongs are about 25μ long; fig. 6 shows a rare kind with prongs widely apart; occasionally a fourth "ray" is present (fig. 5). These spicules are without definite orientation; sometimes the shaft points to the lumen of the poral or oscular tubes, sometimes the prongs; or, again, the spicules may lie parallel to the axis of the chimneys.

Oscular Spicules.—(1) triradiates (Pl. XIV. fig. 12) with unpaired ray longer than paired, tapering, and then slightly swelling to distal end, 104μ long, 5μ thick; paired ray curved, 49μ long. Unpaired angle 150° . Another kind (fig. 13) with nearly equal rays, and a third kind (fig. 14) with the third ray much reduced and approaching in character what Dr. Hinde (2. p. 160) calls the *Corynella*-type in fossil Pharetrones.

(2) Quadriradiates (Pl. XIV. fig. 10), of the same general character as the oscular triradiates, but with relatively longer paired rays.

(3) Monaxons (Pl. XIV. fig. 16) forming a thick pile on the surface of the chimney, considerably thicker than in the case of the poral chimneys. These spicules are 200μ long and only 5μ thick, straight, finely spined in middle region, usually terminating distally in a bayonet point, but sometimes with a straight end.

(4) Tuning-forks (Pl. XIV. fig. 15).

The thick hard basal part of the poral and oscular tubes is composed of thick-rayed tri- and quadriradiates with pointed or sometimes rounded rays, cemented together, and with the gastral ray or odd ray pointing in to the lumen (Pl. XV. fig. 4). Figs. 5, 6, 7 show young separate tri- and quadriradiates, and fig. 8 a stout monaxon with thick spines; this latter kind also becomes cemented with the framework in this region.

The body of the skeleton is formed of thick quadriradiates

with rays united by cement into a firm reticulum with ovoid or sometimes rectangular meshes about 19×14 mm. in total diameter, the spaces being 0.95×0.57 mm., and the strands on an average 0.47 mm. thick. The cement covers the whole spicule, which can be dimly discerned in the axes of the strands of the network; occasionally it is possible to observe definite orientation, all the odd (gastral) rays of spicules pointing in one direction.

The cement commonly shows a fibrillar structure, the fibrillæ radiating from axis to periphery of a strand and projecting more or less beyond the surface of a common matrix in which they are imbedded, thereby dulling the vitreous transparency.

In the axis of the strand of a mesh of the network can be seen the ghostly homogeneous ray of the quadriradiate, which is often provided with a few conical spines. I at first thought the fibres might be separate scleres, but the key to the structure of the cement was found by discovering places where the material was beginning to be laid down. In such places (Pl. XV. fig. 9) a thin film is seen spreading over the surface of a ray of a quadriradiate; at and near the edge of the film the surface is smooth, then granular; later the granules have become tubercles, which gradually increase in length till they resemble long slender cones like pointed stalagmite pillars on the floor of a cavern; still later the spaces between the pillars become filled in by the deposition of more matrix, and the nipple-like points of the conules project above the surface. Sometimes the cement is laid down in flakes, and these, too, are nipple-pointed at the periphery.

A structure showing radiating fibrillæ is present in many fossil Pharetron sponges. Zittel (7. p. 61, fig. 18, and 6. pl. xii. fig. 5) attributes appearances of this kind, in some instances, to the effect of mineral changes, and perhaps they may be; his fig. 88 (*i. c. supra*) is explained, "Fasern eines fossilen Kalkschwammes durch Kristallisation verändert"; but the investigation of the cement of the firm skeleton of *Minchinella*, and still more of *Merlia*, to be described below, leads me to think that the fibrillar appearances in the fossil Pharetrones above referred to may be due to the vital activity of the sponge.

One of the decalcified stained sections had some small fragments of the skeleton still remaining undissolved or only partially dissolved. Here it was possible to see the cells whose function it is to secrete the cement.

By way of analogy with the term "spongoblasts," the name given by F. E. Schulze to the spongin-secreting cells

of horny sponges, I name the cement- or mortar-forming cells of calcareous sponges "telmatoblasts"*. They are unfortunately not well preserved in the present specimens. They form in places a compact layer of columnar cells, about $9\ \mu$ high, with prolongations at the distal ends (Pl. XIII. fig. 9); the base of the cells is closely applied to the outer walls of the tubular canals of the canal system. The contents of the cells are granular, but I was unable to make out the nucleus. The telmatoblasts are evidently modified branched collencytes; in parts where they had not become columnar and aggregated into a compact layer the cells were flattened and discrete, though at the same time joined by branched processes; in this condition a nucleus was visible. There could be little doubt that the latter cells were the same as the columnar cells, but in a different condition, because transitions could be traced, and both kinds formed deeply-stained patches in similar positions relatively to the skeletal strands.

In wholly undissolved skeletal strands the stain of the borax-carmine entered about halfway into the thickness of the same; in half-decalcified strands needles and pillars of the cement were seen separated by a clear space from the columnar telmatoblasts. In a rapidly decalcified stained section the meshes of the tubular network of canals had very strongly contracted, and had imprisoned the telmatoblasts, which likewise had become contracted almost to fine hyaline threads, from which the stain had disappeared excepting from a small point (?nucleus) about the middle of the length.

The central part of the summit of a mortar cell can here and there be seen embracing the point of a stalagmite (or stalactite).

I hope in the course of a few weeks to have some fresh properly preserved specimens of the sponge described below, and to be in a position to give a more detailed account of the nature of telmatoblasts.

Reproduction.—*Minchinella* is hermaphrodite. The embryos belong to the parenchymula type. Pl. XIII. fig. 10 shows one $128\ \mu$ in diameter, surrounded by a nutritive follicle formed of a single layer of large cuboidal blastomeres. The outer layer consists of a columnar epithelium, which surrounds a central mass of large cells. The wrinkling and shrinkage of the embryo is due to the mode of preparation.

The spermatogonia are present in various stages of growth. An early stage in which there has been a division into two

* τέλμα, mortar.

nuclei, one of which is situated centrally and the other peripherally, is common. A later stage in which the peripheral spermatocyte has formed by division a mass, $18\ \mu$ in diameter, of spermatids is also common (Pl. XIII. fig. 11). One ripe cell has burst, liberating a cloud of spermatozoa. The head of a spermatozoon is oval, $2.7\ \mu$ long, at one focus homogeneous and refringent, but at another focus showing a very dark portion, whence the tail originates, and a clear terminal area (Pl. XIII. fig. 11 a).

Chemical Composition.—Dr. G. T. Prior of the Mineral Department applied Meigen's test by boiling some powdered skeleton in solution of nitrate of cobalt, and obtained the reaction for calcite. Accordingly the composition is similar to that of *Petrostroma schulzei* Doderlein.

Subfamily *MERLINÆ*, nov.

Pharetronidæ in which the solid skeletal framework is constructed of vertical main beams of fibrillar cement, from each of which there radiate three vertical flanges to meet similar flanges from other columns so as to form cylindrical tubes; the latter are partitioned off by horizontal floors, a honeycomb-like structure resulting. Solid framework without axial core of spicules.

In the subfamily Lithoninæ the framework is constructed on the *béton armé* principle; in Merlinæ the *béton* is not *armé*, the axial stiffening of spicules being dispensed with.

MERLIA, gen. nov.

Merlinæ encrusting; with the dermal membrane supported by tufts of slender tyles, and with raphides; tuning-fork spicules present.

Merlia normani, sp. n.

The specimens consist of four small dried pieces of rock material, each encrusted by a thin layer of the sponge. The rock-fragments formed part of an agglomerated mass of broken shells, worm-tubes, corallines, &c., about the size of a man's fist, obtained from 60 fms. off Porto Santo Island near Madeira, by Senhor Adolpho C. de Noronha, and given by him to Canon Norman, who entrusted the specimen to me to describe.

Two of the smaller pieces have been used up for vertical and horizontal sections.

The largest specimen forms a very thin crust 14×7 mm. in area, and with thin edges. The surface is covered with a cream-coloured membrane and has an extremely fine uni-

formly granular appearance. An oscule, just visible to the naked eye, is seen as a dark point near one end ; two smaller oscules occur, but are not discernible without a lens.

Under a lens, the surface shows small polygonal areas, each bounded by 5-7 small tubercles ; the latter push up the dermal membrane, which is sunk a little in the areas themselves. The largest oscule is oval, slightly raised, $.28 \times .15$ mm. in its long and short diameters, and surrounded by nine tubercles ; in fact, it resembles two smaller pore-areas run together. The pore-areas are about $\frac{1}{2}$ of a millimetre in diameter, and in several a single large pore was visible in the centre of the covering dermal membrane.

A vertical section shows a vertical series of honeycomb-like cells separated from each other by horizontal perforate floors (and ceilings) and by vertical imperforate walls. A vertical section, complete from base to surface, with four superposed "cells" was .665 mm. thick.

The honeycomb cells are cylindrical, and the vertical section shows rectangular areas (150μ long $\times 120 \mu$ broad), just as the same section of a solid cylinder would ; similarly the horizontal section shows circular areas.

The sponge is attached to the substratum on which it is growing by a thin floor of fibrillar cement. The vertical pillars, which are the main scaffolding, arise from this floor and pass up to the surface, where they end in the tuberculated knobs.

From each pillar there radiate out three wings, which meet similar wings from other pillars, a median raphe showing the line of junction. Accordingly each pillar has six sides, three concave ones forming segments of the cylinders they help to form, and three straight band-like edges forming the vertical edges of the wings. The direction of the fibrillæ marks off wings from opposing pillars, the fibrillæ radiating out more or less obliquely outwards and upwards from the central axis of a pillar to the raphe.

The floors (and ceilings) which exhibit fibrillar structure, show also five or more radial raphe lines where sections of flooring from each pillar are joined ; in the centre of the floor is a circular hole, which may be reduced to a fine slit. Very fine concentric lines are seen on the floors.

A surface view (Pl. XV. fig. 13) shows well the tubercles each with three thick wings or bars radiating out below them, to meet similar bars.

The fused bar shows the median raphe and the opposing fibrillæ.

A very careful examination under all powers and lights

failed to reveal any axial core of spicules, though often there were appearances strongly suggesting the presence of such objects ; but on focussing, these ghosts were seen to be optical illusions.

Though there are no axial spicules present, there is justification for putting forward the theory that the sponge originally had a skeleton of quadriradiates joined and enveloped with cement ; the spicules would be orientated with their odd ray in a vertical plane and basal rays in a horizontal plane. Each vertical pillar in the framework, as it now stands, is simply the point whence three wings radiate out, at angles of 120° .

The Lithoninæ may be compared to Chalinid Sponges, and the Merlinæ to Horny Sponges which have lost an axial core of spicules, which presumably they had, in many instances, formerly possessed. The latter analogy, however, is not quite perfect, because *Merlia* has proper spicules. These consist of tufts of long slender tyles which pass up obliquely from the floor of the uppermost "cells" to the membranous roof and spread out so as to support it. These spicules are $97\ \mu$ long, $1.7\ \mu$ thick ; the heads being oval, and $5\ \mu$ long by $2\ \mu$ broad ; they are slightly curved and taper to a sharp point. The rhaphides lie in the dermal membrane ; they are $55\ \mu$ long, very slender and curving to a fine hair-like extremity. Microrhaphides slender, crescentic, $15\ \mu$ long, also lie in the dermal membrane, and are probably distinct spicules, and not broken off ends of the longer rhaphides.

Tuning-forks are only $52\ \mu$ long, the shaft being $32.5\ \mu$ and prongs $19.5\ \mu$ long.

The skeleton of *Merlia* is composed of calcite.

The occurrence of the radial fibrillar cement in the Lithoninæ and Merlinæ led me to hope that some light would be thrown on that extremely aberrant form *Astrosclera willeyana*, Lister (5. p. 459). A dried fragment of the macerated skeleton of *Astrosclera*, at first sight, looks not unlike a similar fragment of *Minchinella*. In each there is a firm porous skeletal reticulum, and in each the surface of the strands of the network present a finely punctate or granular appearance due to the projecting of the ends of fine fibrils above the general surface.

In *Astrosclera* the scleres are in the form of polyhedral blocks, which are formed in the interior of scleroblasts ; and further the skeleton is made of aragonite.

The possibility has suggested itself to me that these scleres are of the nature of cement blocks, which have originally been deposited round an axial skeleton that has disappeared.

and that the scleroblasts may be extremely modified enveloping telmatoblasts. I have no direct evidence to bring forward in support of this hypothesis, and there is much to say against it, but the investigation of the remarkable cement formation in *Lithoninæ* and *Merlinæ* affords, I think, some justification for the statement that a theory of this kind may be worth considering.

List of Lithoninæ and Merlinæ.

Subfam. LITHONINÆ, Doderlein.

1. *Petrostroma schulzei* Doderlein. Japan, 100-218 fms. (1. p. 15.)
2. *Plectroninia hindei* Kirkp. Funafuti, 50 fms. (4. p. 345.)
A minute specimen provisionally placed in genus *Plectroninia*, Hinde (3. p. 51.), but doubtfully belonging there.
3. *Minchinella lamellosa* Kirkp. New Hebrides, 70 fms.

Subfam. MERLINÆ.

4. *Merlia normani* Kirkp. Porto Santo, 60 fms.

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EXPLANATION OF THE PLATES.

PLATE XIII.

Minchinella lamellosa, gen. et sp. n.

- Fig. 1. *Minchinella lamellosa*. Specimen A. The type. Poral surface. Nat. size.
- Fig. 2. The same; oscular surface. Nat. size.
- Fig. 3. Smaller specimen, B; poral surface. Nat. size.
- Fig. 4. Pore-chimneys of spec. A, $\times 3$.
- Fig. 5. Oscular chimneys of spec. A, $\times 3$.
- Fig. 6. Poral chimneys of spec. B, $\times 3$.
- Fig. 7. Excurrent canals with flagellated chambers (spec. B), $\times 90$.
- Fig. 8. Collar cells, $\times 880$.
- Fig. 9. Telmatoblasts (mortar cells), $\times 880$.
- Fig. 10. Embryo, section, $\times 125$.

Fig. 11. Sperm ball, $\times 1100$; *11 a*, spermatozoa, $\times 1100$.

Fig. 12. Firm skeletal network : *a*, axial spicule ray, $\times 90$.

Fig. 13. Strand of network showing ray of quadriradiate surrounded by fibrillar cement : *a*, axial spicule ray; *b*, cement. $\times 525$.

PLATE XIV.

Minchinella lamellosa.

Spicules, all magnified 525. Figs. 1-9 poral spicules; figs. 10-16 oscular spicules.

Fig. 1. Quadriradiate of poral chimney.

Fig. 2. A larger example of the same.

Fig. 3. Quadriradiate with long gastral and nearly equal basal rays; unpaired ray spined.

Fig. 4. Triradiate (poral).

Figs. 5, 6. Tuning-fork spicules; fig. 5 with extra prong.

Fig. 7. Monaxon from layer forming a pile on poral chimney.

Fig. 8. Longer slenderer monaxon from upper end of poral chimney.

Fig. 9. Spicule from fringe round upper end of poral chimney.

Fig. 10. Oscular quadriradiate.

Fig. 11. Ditto, with very short unpaired basal ray.

Fig. 12. Triradiate (oscular) with long unpaired ray swollen towards distal end.

Figs. 13, 14. Triradiates with medium and very short unpaired rays.

Fig. 15. Tuning-fork spicule.

Fig. 16. Monaxon, from layer forming a pile on surface of oscular chimney.

PLATE XV.

Minchinella lamellosa, figs. 1-9. *Merlia normani*, figs. 10-18.

Fig. 1. *M. lamellosa.* Upper end of poral chimney of specimen A, longitudinal section, $\times 40$.

Fig. 2. Longitudinal section of upper end of oscule of specimen A, $\times 90$.

Fig. 3. Transverse section of oscular chimney, $\times 90$.

Fig. 4. Large quadriradiates and some triradiates slightly cemented, from base of poral chimney, and showing transition-stage to firm network forming body of sponge, $\times 150$.

Figs. 5-7. Stages of young quadriradiates not yet cemented, $\times 525$.

Fig. 8. Large monaxon, occurring in hard base of poral and oscular chimney, $\times 525$.

Fig. 9. Strand of skeletal network showing development of incasing cement, firstly a thin carpet, then stalagmites, the latter finally immersed in cement matrix : *a*, axial spicule ray. $\times 525$.

Fig. 10. *Merlia normani*, gen. et sp. n., encrusting rock : *a*, oscules. Nat. size.

Fig. 11. Surface enlarged, showing a pore in membrane covering each polygonal area, $\times 45$.

Fig. 12. Vertical section of a surface "honeycomb" cell, showing membranous roof supported by tufts of fine tyles, $\times 90$.

Fig. 13. Surface of macerated skeleton, with a tuning-fork spicule on one of the floors : *a*, tubercle at end of vertical column; *b*, raphe; *c*, horizontal floor. $\times 90$.

Fig. 14. Vertical section : *a*, vertical column; *b*, raphe; *c*, floor. $\times 90$.

Fig. 15. Tytes, $\times 525$.

Fig. 16. Rhaphides in dermal membrane, $\times 525$.

Fig. 17. Slender curved micro-rhaphides in dermal membranes.

Fig. 18. Tuning-fork spicules, $\times 525$.

LXX.—*Descriptions of new Batrachians and Reptiles discovered by Mr. M. G. Palmer in South-western Colombia.*
By G. A. BOULENGER, F.R.S.

IN a previous number of these 'Annals' * I have described three new reptiles from Mr. M. G. Palmer's collection in South-western Colombia under the names of *Lepidoblepharis peraccae*, *Anolis palmeri*, and *Atractus melas*. I am now able to add three batrachians and six reptiles to the list of the discoveries of this successful collector.

Hyla palmeri.

Tongue circular, nearly entirely adherent. Vomerine teeth in two curved transverse series close together just behind the level of the rather large choanæ. Head rather small, a little broader than long; snout short, rounded, not projecting beyond the mouth; canthus rostralis obtuse; loreal region very oblique, concave; interorbital region much broader than the upper eyelid; tympanum distinct, half the diameter of the eye. Outer fingers nearly half-webbed; no rudiment of pollex; toes entirely webbed; disks as large as the tympanum; subarticular tubercles small. The tibio-tarsal articulation reaches the eye. Skin granulate, more coarsely on the belly and under the thighs; a curved fold from the eye to the shoulder, covering the upper third of the tympanum; a sinuous transverse fold above the vent; a fold along the outer side of the arm and of the tarsus; an obtusely pointed dermal flap at the heel. Yellowish, with small black spots or dots on the head and anterior part of the body.

From snout to vent 43 mm.

Two specimens, female and young, from Jimenez.

Leptodactylus mantipus.

Tongue oval, entire. Vomerine teeth in two slightly arched series behind the choanæ. Snout rounded, as long as the orbit, not projecting beyond the mouth, with well-marked canthus and oblique, concave loreal region; nostril nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum three-fifths the diameter of the eye. Fingers rather short, with feebly swollen tips, first and second equal; toes moderate, not fringed, the tips dilated into small but very distinct disks; subarticular

* See, 8, vol. i. 1908, p. 111.

tubercles moderate; two small metatarsal tubercles. The tibio-tarsal articulation reaches the eye. Back with small warts, some of them confluent into short ridges; a glandular dorso-lateral fold. Greyish above, tinged with pink between the canthi rostrales and dorso-lateral folds; dark markings on the back and a dark cross-band between the eyes; a dark canthal streak; sides of body dark grey, dotted with whitish; limbs with dark cross-hands; lower parts brown, dotted with whitish.

From snout to vent 33 mm.

A single specimen from San Antonio.

Hyloides calcaratus.

Tongue oval, slightly nicked behind. Vomerine teeth in two small groups behind the level of the choanæ. Head slightly broader than long; snout rounded, not projecting beyond the mouth, with obtuse canthus and concave loreal region; interorbital space broader than the upper eyelid; tympanum distinct, one-third the diameter of the eye. Fingers and toes with moderately large terminal disks; first finger shorter than second; toes free. Tibio-tarsal articulation reaching between the eye and the tip of the snout. Skin smooth above and beneath; a small conical tubercle on the upper eyelid and another on the heel. Pink and greenish above, with olive, black-edged, symmetrical markings; lower parts greyish brown, marbled with blackish.

From snout to vent 17 mm.

A single specimen from San Antonio.

Anolis eulæmus. (Fig. 1.)

Head moderate, once and two-thirds as long as broad, as long as the tibia; forehead and interorbital and occipital regions deeply concave; frontal ridges short and weak; upper head-scales small, keeled, the larger pluricarinate; scales of the supraorbital semicircles enlarged, separated by two series of scales; largest supracoculars not larger than the scales on the middle of the snout; occipital enlarged, but smaller than the ear-opening, separated from the supraorbital semicircles by five or six rows of scales; canthus rostralis distinct, canthal scales seven or eight; loreal rows eight or nine; seven upper labials to below the centre of the eye; ear-opening large, oval. Gular appendage very large, extending posteriorly beyond the thorax; gular scales smooth. Body compressed; a slight nuchal fold. Scales very small, granular, larger and keeled on the middle of the back, largest

and smooth on the belly. The adpressed hind limb reaches the nostril; digital expansions moderately broad; 21 lamellæ under phalanges ii. and iii. of the fourth toe. Tail feebly compressed, without dorsal series of enlarged scales, a little over twice as long as head and body. Male with enlarged postanal scales. Purplish brown above, with rather indistinct darker transverse bars on the back and large round lighter spots on the sides; lower parts whitish, the gular appendage brown in front.

	mm.
Total length	290
Head	24
Width of head	14
Body	66
Fore limb	45
Hind limb	77
Tibia	24
Tail	200

A single male specimen from near Pavas.
Allied to *A. fasciatus*, Blgr.

Fig. 1.

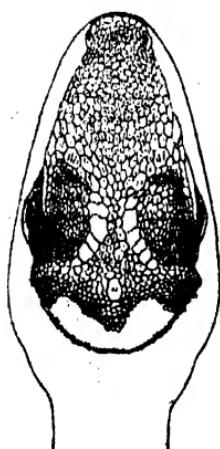


Fig. 2.

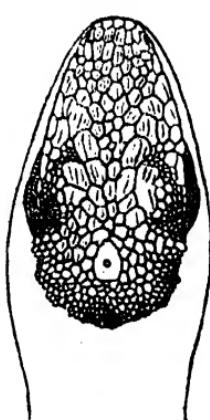


Fig. 1.—*Anolis eulemus*.
Fig. 2.—*Anolis antonii*.

Anolis antonii. (Fig. 2.)

Head moderate, once and two-thirds as long as broad, a little longer than the tibia; forehead concave, frontal ridges short but strong; upper head-scales rather large, rough and strongly keeled; scales of the supraorbital semicircles

enlarged, separated by one series of scales; two strongly enlarged supraoculars, broader than long and in contact with the supraorbitals; occipital larger than the ear-opening, separated from the supraorbitals by two series of scales; canthus rostralis sharp, canthal scales four; loreal rows five; six or seven labials to below the centre of the eye; ear-opening moderately large, oval. No gular appendage (female); gular scales feebly keeled. Body cylindrical. Dorsal scales small, flat, keeled, becoming gradually smaller towards the sides, where they are minute and granular; ventral scales larger than dorsals, flat, juxtaposed, faintly keeled. The adpressed hind limb reaches the eye; digital expansions moderately broad; 16 lamellæ under phalanges ii. and iii. of the fourth toe. Tail not compressed, once and two-thirds as long as head and body, covered with large strongly keeled scales. Reddish brown above, with a series of six small dark brown spots on the spine; a rusty, dark-edged cross-band between the eyes; lower parts much obscured by brown dots.

	mm.
Total length	143
Head	15
Width of head	9
Body	38
Fore limb	21
Hind limb	39
Tibia	12
Tail	90

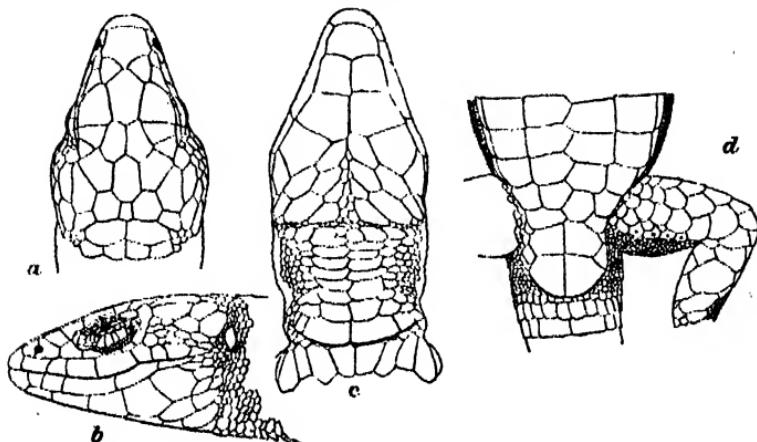
A single female specimen from San Antonio.
Allied to *A. fusco-auratus*, d'Orb.

Prionodactylus palmeri. (Fig. 3.)

Snout short; body rather short. Upper head-shields distinctly striated; fronto-nasal single, forming a short suture with the frontal; fronto-parietals, parietals, and interparietal subequal in size; three occipitals, median smallest; two large transverse postoccipitals; three supraoculars, first largest; nostril between two nasals; posterior nasal, loreal, and freno-ocular forming a triangle; upper temporals large, lower small, not keeled; seven upper and five lower labials; chin-shields, one anterior and four pairs, the two first pairs forming a suture; a double longitudinal row of transversely enlarged gulars; collar-shields eight, the median pair very large. Dorsal scales strongly keeled, about twice as long as broad; upper lateral scales small, hexagonal, keeled, lower very small, granular, smooth; 50 scales, including ventral

plates, round the middle of the body, 31 from occiput to base of tail. Ventral plates large, in six longitudinal rows, median and outer smaller than the others, and 20 transverse rows. Two pairs of large praeanals, an anterior and a posterior, and a small shield on each side. Subdigital scales smooth. 4 or 5 femoral pores on each side. Caudal scales forming regular

Fig. 8.



Prionodactylus palmeri. a, upper view of head; b, side view of head; c, lower view of head; d, anal region.

annuli, upper like the dorsals, lower larger and smooth. Brown above, with a light dorso-lateral streak between two dark ones; a fine yellowish line on the upper lip, extending to the shoulder, continued on the body as a series of white, black-edged ocelli; chin and throat pale olive-brown, belly orange, spotted with black.

	mm.
Total length (tail reproduced)	127
Head	17
Width of head	11
From end of snout to fore limb.....	25
" vent.....	67
Fore limb	21
Hind limb	32

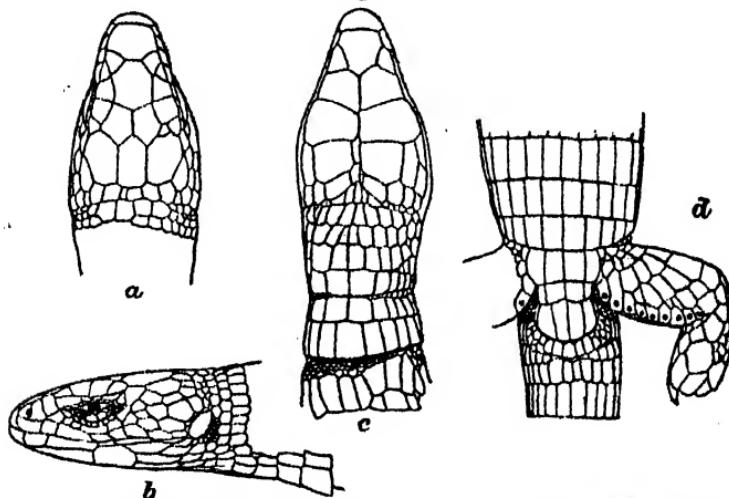
A single female specimen from San Antonio.

Euspondylus stenolepis. (Fig. 4.)

Head small, snout short and very obtuse; body elongate. Fronto-nasal broader than long, forming a suture with the

frontal, separating the small praefrontals; frontal little longer than broad; interparietal pentagonal, as long as and a little narrower than the parietals; five small occipitals; four supraorbitals, first smallest; nostril between two nasals; posterior nasal in contact with the freno-orbital; a loreal; a series of large infraorbitals; temporal shields large; seven upper and five lower labials; chin-shields, four pairs, first small and separated by a large post-symphysial, second and third forming a median suture; gular platea large, forming

Fig. 4.



Euspondylus stenolepis. a, upper view of head; b, side view of head; c, lower view of head; d, anal region.

seven transverse series between the chin-shields and the collar-plates, of which there are nine. Dorsal scales very narrow, obtusely keeled, shorter than the ventrals; 44 scales round the middle of the body, ventrals included, 30 from occiput to base of tail. Ventral plates large, in 12 longitudinal and 18 transverse series. Four anterior and four posterior praeanals, anterior as long as broad, posterior much longer than broad. 9 femoral pores on each side. Caudal scales like those on the body. Dark brown above, yellowish beneath; a rather indistinct light dorso-lateral streak.

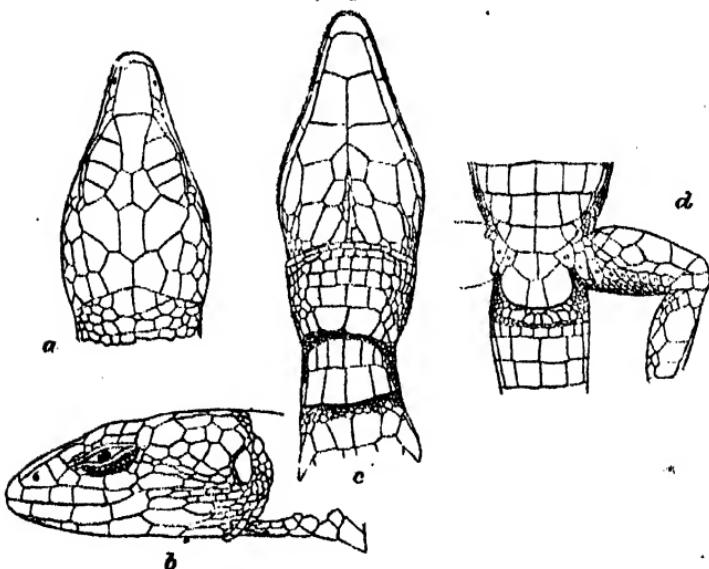
	mm.
Total length (tail reproduced)	95
Head.....	12
Width of head.....	7
From end of snout to fore limb.....	20
" vent.....	58
Fore limb	14
Hind limb	20

A single male specimen, taken from the stomach of a bird at San Antonio.

Oreosaurus laevis. (Fig. 5.)

Head rather elongate, snout pointed; body moderately elongate. Fronto-nasal quadrangular, much longer than broad, as long as the frontal; frontal pentagonal, as broad as the fronto-nasal in front, narrower behind; fronto-parietals shorter than the interparietal, which is hexagonal and much narrower than the parietals; a pair of occipitals; four supraoculars; a loreal; a row of large infraorbitals; temple shielded; six upper and four lower labials; chin-shields, one

Fig. 5.



Oreosaurus laevis. a, upper view of head; b, side view of head; c, lower view of head; d, anal region.

anterior and three pairs, the two first pairs forming a suture and followed by large gulars which, further back, form six transverse series; collar-shields six. Dorsal scales smooth, quadrangular, twice to twice and a half as long as broad; lateral scales small, flat granules; 34 scales, including ventral plates, round the middle of the body, 37 from occiput to base of tail. Ventral plates large, in 8 longitudinal and 19 transverse rows. Präanal plates five, two in front, three behind. Scales on the limbs smooth, except on the upper

surface of tibia, where they are faintly keeled. 9 or 10 femoral pores on each side. Caudal scales smooth, quadrangular, forming regular annuli. Blackish brown, with scattered white dots above, these dots being in the centre of large round black spots; ventral plates edged with whitish behind.

	mm.
Total length	160
Head	19
Width of head	11
From end of snout to fore limb	30
" " vent	72
Fore limb	22
Hind limb	25
Tail	88

A single male specimen from San Antonio.

Geophis nigro-albus.

Maxillary not extending beyond palatine in front, the first tooth corresponding to the suture between the second and third labial shields. Eye small, nearly as long as its distance from the mouth. Rostral rather large, a little broader than deep, the portion visible from above measuring about one-third its distance from the frontal; internasals broader than long, one-third the length of the praefrontals, which are as long as broad; frontal broader than long, as long as its distance from the rostral, much shorter than the parietals; supraocular small, but more than twice as large as the postocular; loreal twice as long as deep; one postocular; six upper labials, third and fourth entering the eye; three or four lower labials in contact with the anterior chin-shields, which are slightly longer than the posterior and separated from the symphysial. Scales in 15 rows, smooth on the anterior part of the body, feebly but distinctly keeled on the posterior part. Ventrals 142; anal entire; subcaudals 48. Blackish above; head behind the supraoculars and front and lower parts white.

Total length 135 mm.; tail 25.

A single young specimen from Pavas.

Very closely allied to *G. hoffmanni*, Peters.

LXXI.—Agamidæ and Iguanidæ.

WHILST arranging some portion of early correspondence I came across a letter from my late friend, Professor Kaup, d. Darmstadt, Novbr. 23, 1869, in which he incidentally refers to the fact that he had been the first to recognize by the different insertion of the teeth the two zoogeographical divisions of Lacertilia, which ever since have been distinguished as Agamidæ and Iguanidæ, appealing to me to vindicate his claim of priority. After this lapse of time it would be useless for me to enquire why I omitted to comply with his request at the time; I can only say that the omission was quite unintentional, but I consider it a duty to rectify it now.

This, indeed, should be unnecessary inasmuch as already Wiegmann, in the *Herpetol. Mex.* 1834, p. 13, has fully acknowledged and established Kaup's claim. He says:—
 “Hanc diversitatem geographicam oculatissimus Kaupius primus detexit, et in *Iside* 1827. p. 610 docte exposuit. Ill. Waglerus Kaupii nullam faciens mentionem, rem jam a me stabilitam (*Isis* 1829. p. 422) denuo protulit quasi novam, et a semet ipso inventam (*S. A.* p. 228). Haec, salva in cineres amicissimi viri pietate, ne Kaupii nostri merita laudesque imminuerentur, reticere nolui, quum Cel. Oken, quod illi debebat tribuere, mihi falso adscripsit (*Isis* 1831. p. 1015). Nihil enim equidem in hac re detexi, nihilque addidi, nisi quod legem indicavi, qua Sauri per orbem terrarum dispersi videantur.”

The cause why Kaup's merits in the matter were not equally recognized or entirely overlooked in subsequent or modern herpetological works may be found in the unfortunate circumstance that he omitted to give technical names to the two groups, designating them as

-  1. Höhere Saurier der Neuen Welt (with six genera), and
- 2. Höhere Saurier der Alten Welt (with nine genera).

This was done by Gray, who, singularly enough, in the same month of the same year (July 1827) published in the ‘Philosophical Magazine’ an arrangement of the families of Lacertilia, with partial indication of their geographical range. He divided them into seven families, of which the fifth is named Iguanidæ (without locality) and the seventh Agamidæ (comprising genera from the “Old and New World, New Holland and India”), the Chamæleonidæ occupying the

place between them. Gray, like Kaup, distinguished the Agamidæ from the Iguanidæ chiefly on account of the mode of insertion of their teeth in the jaws; but his then imperfect knowledge of their geographical ranges prevented him from perceiving the fact that the difference in their dental characters coincided with their distribution over the globe. Evidently this fact was first pointed out by Kaup. A. GÜNTHER.

LXXII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXX. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plates XII. & XII. a.]

1. On the Stranding of an Adult Female *Mesoplodon bidens*, Sowerby, at St. Andrews.
2. On an Abnormal Plaice with a Precaudal Fin-frill on the Left Side.
3. On *Orthagoriscus mola*, Bl.
4. On the British *Spherocephalidae*, *Chloramidae*, and *Chaetopteridae*.
5. On the same Families dredged in the 'Porcupine' Expeditions of 1809 and 1870.
6. On the foregoing Families dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.
7. On the same Families dredged in Norwegian Waters and in Finmark by Canon Norman.

1. *On the Stranding of an Adult Female Mesoplodon bidens, Sowerby, at St. Andrews.*

For some days in May the fishermen had observed a whale moving between the Castle and the mouth of the Eden about a mile from shore. Then on the afternoon of the 28th May a fisherman-caddie, George Brown, saw what he thought was a horse floundering in the sea about a mile from the Club-house and in shallow water about 150 yards from the edge.

It floundered on parallel with the shore about 100 yards, apparently after having touched the bottom and without being able to turn its head seawards. He and others went out, waded into the water, and found the whale, which was of a brownish-black colour, paler ventrally, still living, and beating the water with its tail. They prevented the receding tide carrying it out, though, perhaps, such was not likely to happen, and it died in ten minutes. When preparing the carcass, which was over 16 feet in length, for a skeleton, A. W. Brown, of the Laboratory, found that the left shoulder and arm were extensively ecchymosed, the muscles and

tissues being infiltrated with blood, and with a tendency to rapid putrefaction. The bruise extended from the scapula to the humerus and the armpit as well as to the hand. The macerated left humerus showed an ovoid depressed surface, 1 inch by half an inch, about an inch from the anterior edge of the head, and somewhat obliquely situated on the front of the bone and near its middle. The only explanation of the injury is that the Fleet had been at gun-practice for some time off St. Andrews Bay, and a spent shot or a fragment of a shell may have struck the animal, rendering it more or less helpless on the left side, and causing it to seek the shallow water.

Nothing occurred in the stomach except mucus and parasites, and the same with the intestines.



Mesoplodon bidens from the ventral surface.

In the accompanying sketch (see figure), which has been made from a photograph by A. W. Brown, the left side is presumed to be partly immersed in the wet sand during a shower of rain, but the flipper and right groove (*a*) on the throat are shown. The latter seems to follow the trend of the mandible, and ceases before reaching the mid-ventral line.

Notices of the occurrence of this whale are given in Bell's 'British Quadrupeds' * &c., and the skeletons have been dealt with by Sir William Flower and Sir William Turner, the latter of whom has kindly promised to look over the bones of this example.

2. On an Abnormal Plaice with a Precaudal Fin-frill on the Left Side.

The publication of my friend Mr. Boulenger's † very interesting example of a malformed plaice from the London

* Second edition.

† Proc. Zool. Soc. 1908, pp. 161-104, text-figs. 28 & 29.

market recalls a similar case included in the Tenth Annual Report of the Fishery Board for Scotland (1892) *. In this the right (coloured) side presents a fairly normal appearance, except that near the caudal an irregularity of the fin-rays—both dorsal and anal—occurs. A few irregular fin-rays are at a different level from the rest when the fish is placed on a flat surface right side up. On the left side the lateral line posteriorly is curved gently to the dorsal edge, and terminates about half an inch in front of a somewhat elevated border stretching between the dorsal and anal interspinous regions. This elevated border is fringed with a continuous series of rays. The first of the irregular series ventrally pass from the anal interspinous bones at a forward angle, and the transverse rays follow in order. The rays joining the dorsal are crowded and almost form a double series at the prominent fold of the region. The interspinous elements show a tendency both at the dorsal and the ventral edge to follow the abnormal transverse or vertical fin, but they appear to be deficient in the central region, though slight folds are visible. The lateral line commences anew from beneath the centre of the transverse or vertical fold, and goes straight back, as usual, to the caudal. The left side is of the normal colour, with the exception of a circular patch of black about $\frac{1}{2}$ of an inch in diameter, which is situated below the lateral line and almost covered by the membrane and rays of the abnormal fin. Above the lateral line is another minute speck. The scales of the caudal region on the right do not appear to differ from an ordinary example, and those on the left do not call for remark.

Mr. Boulenger's specimen agrees with the foregoing in the absence of the fin-frill from the coloured side and in the presence of a deep notch dorsally and ventrally behind the abnormal fin. There are slight differences in regard to the continuity of the marginal fins and the abnormal one, but the condition in each evidently springs from the same cause. He thinks that at an early stage of its existence the fish lost the posterior part of its caudal region at the point now indicated by the truncature on the blind side; "it at once proceeded to repair the injury by producing a secondary terminal fin, viz., the transverse structure connecting the dorsal with the anal . . . But at the same time, or soon after, the true tail asserted its rights, and grew again, alongside the secondary fin, and this regeneration would fall under what Prof. Giard has designated as 'Régénérations hypotypiques.'"

* Part iii. pp. 298 & 299, pl. xvii. fig. 5.

Such an interpretation is very interesting, but it was not that which suggested itself in former years. A re-examination of the St. Andrews example shows that no trace of regeneration occurs superficially in the fairly normal right or coloured side; that the vertebral column runs normally to the base of the tail; and that no irregularity is visible from the hypural elements forward for more than twenty vertebræ, the skeleton being the same as in other examples, except that a slight dorsal curve is visible a little in front of the fin-frill, an indication, perhaps, of the peculiarity in constitution (*dyscrasia*) which may be associated with the abnormal fin. Moreover, the condition on the left side is explicable without calling in the loss of the tail in the early condition. The precaudal fin-frill may be a simple abnormality arising from hypertrophy or a hereditary tendency to excess of fin-growth —akin, for instance, to polydactylism or the extra fins of the golden carp.

3. *On Orthagoriscus mola, Bl.*

This fish is occasionally found in the neighbourhood of St. Andrews Bay, especially in the mouth of the Forth, where a small example appeared off Crail on the 9th October, 1908. Such a small form shows the greenish-blue silvery lustre quite as much as the larger. This example had a length of 23 inches and a depth of $14\frac{1}{2}$, whilst across the dorsal and anal fins it measured $32\frac{1}{2}$ inches. The dorsal fin was $9\frac{1}{2}$ inches long and the anal $9\frac{1}{4}$ inches. Like other examples it was swimming leisurely at the surface of the water with the dorsal fin projecting. The stomach was empty and the intestine contained glairy mucus amongst which were several parasites.

Though the examples captured off the shores of Fife do not reach the gigantic size of that shown in the London Fisheries Exhibition of 1883 *, and which measured 12 feet from the tip of the dorsal to that of the anal and 8 feet in length of body, yet some caught in the Forth and in St. Andrews Bay are of considerable size. Thus Day † records one from Pittenweem 8 feet across the fins, a body 4 feet long, and it is interesting that they have generally been caught in October or November. Thus one caught on the 4th of October, 1862, in St. Andrews Bay measured 4 ft. 8 in. across the fins, and, in addition to the points indicated in the 'Fauna of St. Andrews' ‡, and quoted by Day, it may be mentioned that its

* 'Scandinavian Fishes,' Fries, Ekström, Sundevall, and Wright, ii. pp. 626 *et seq.*

† *Brit. Fishes*, ii. p. 275.

‡ P. 183.

respiration was so active that before capture it spouted water from each gill-slit. The circumference was 8 ft. 6 in. In the stomach was a large quantity of greyish mucus with fragments of cestodes. The parasites mentioned subsequently were found not only amongst the muscles, but in the liver, and many pyriform scolex-like forms occurred in the same tissues.

Dr. Wm. Nicoll reports that in the small example he found, in the lower part of the intestine and the rectum, about fifty specimens of *Dihemistephanus lydiae*, Stossich, one of the spinous trematodes with a peculiar configuration of the cephalic spines. He also found about a dozen examples of the cestode *Anchistrocephalus microcephalus*, Rud., in the intestine. Moreover, besides *Acanthocephalus reptans* (*Gymnorhynchus horridus*, Goodsir) in the muscles, *Acanthocephalus elongatus* burrowed in all directions in the liver. Dr. Calman kindly identified *Cecrops latreillii*, Leach, which was found, as in 1862, infesting the gills, and *Lepeophtheirus nordmanni*, M.-Edw., which occurred in considerable numbers on the skin, the latter not having been present in the larger example in 1862, which, however, had numerous specimens of *Tristoma coccineum* on the surface.

4. On the British Sphærodoridæ, Chloræmidæ, and Chætopteridæ.

The first family is extremely limited both in respect to genus and species, the common form, *Ephesia gracilis*, H. Rathke, being that formerly entered by Dr. Johnston in the Catalogue of the British Museum and by Dr. Allen in the 'Fauna of Plymouth' (1904). The species seems to be everywhere distributed in British waters, from the tidal region to 6 or 15 fathoms or more, the finest examples coming from the deeper water off St. Andrews Bay. It is a form which exhibits only moderate activity, crawling slowly about or throwing itself into coils. It extends to Norway, Spitzbergen, and Greenland.

The foot has dorsally the opaque white globular process which appears to be a modification of a cirrus. It is smooth throughout and has at its outer and upper surface a clavate papilla similar to those on the surface of the body. That conical setigerous lobe occurs beneath, and its surface and tip are hispid with large papillæ of the kind already mentioned. It is supported by a single, strong, translucent, tapering spine, which has a tip simply pointed. The number of the bristles is usually four, and they have a characteristic

shape at the tip, like a billhook. A form from the Channel Islands, however, differs from the foregoing and agrees with *Ephesia antarctica* of the 'Challenger' Expedition in having articulated bristles, the shaft showing the same distinct curve backward at its distal third, a dilated and bevelled end, but with a short tapered terminal piece. Yet some show fusion of the terminal process, and thus transform the bristle into the ordinary type. Whether as knowledge extends the foreign forms as well as the foregoing may be amalgamated with the common type is still an open question. At any rate, so far as general structure goes, *Ephesia* appears to be a near ally of the Syllidae.

Two British species of Chloræmidæ were included in Dr. Johnston's Catalogue in 1865, viz. *Stylarioides plumosa*, O. F. M., as *Trophonia plumosa*, and *Flabelligera affinis*, Sars, as *Siphonostoma uncinata*, And. & Edwards. In the 'Fauna of Plymouth' (1904) no addition has been made to the foregoing meagre list. Besides these, several additional forms have to be noted, some of which are known in Norwegian waters, whilst others do not appear to have been described.

Stylarioides plumosa, O. F. M., is generally distributed in the North European seas, and extends to Greenland and the American shores; and though common between layers of shale and laminated sandstone, or in dark odoriferous mud, yet the cod and the haddock seem to find it out, probably after dislodgment by storms. The stomach of the latter occasionally contains dozens. It is a striking form—with its pinkish palpi, grass-green branchiæ, long resplendent anterior bristles, and its rugose surface. The mouth is a vertical slit below the palpi, with fleshy lips which slowly open and close in the continuous swallowing of water and probably also of muddy sand as food under ordinary conditions. The inner surface of the lips is pale reddish brown. Rarely a hoof-shaped process, with the flat surface pointing ventrally, is thrust out, the anterior or dorsal arch having the eight green branchiæ along its edge, whilst posteriorly are two external lateral, two small median below the mouth, and a larger posterior or ventral process besides the palpi. On an eminence in the centre above the mouth are two brown pigment-spots which may represent eyes. In a partially contracted example—living or dead—the anterior region shows a vertical slit, more or less widened in the centre according to circumstances, and having a frilled margin surrounded by a fringe of longer papillæ. On each side is a

vertical ridge slightly divided into a dorsal and ventral division, and from each of these springs a remarkably long tuft of the characteristic golden bristles which stretch far in front of the animal and refract the light beautifully. From the forward and upward direction of these bristles they would not appear to be of much service on a flat surface, but they would be of use on the wall of a tube or tunnel, as well as protect the branchiae and palpi. Similar but shorter bristles follow in the dorsal division throughout the body. Moreover, in the fourth segment the ventral series consists of stout spines with a double curve, some of which, however, have slender translucent tips—indicating that the succeeding and more perfect hooks are only modifications of an articulated bristle. Small examples about an inch in length differ from the adults (of 4 or 5 inches) in the smaller number of segments, 47 or 48 instead of 60-80, and in the less dilated anterior region. It is interesting that the type of bristle seen in this form persists in species from the Indian and other oceans, as shown, amongst others, by Prof. Ehlers* in his recent beautiful work on the Annelids of the German Deep-sea Expedition.

The second form, *Stylarioides glauca*, Mgrn., has long been known in Zetlandic waters, where it was first obtained by Dr. Gwyn Jeffreys, and it extends to Norway and Sweden. It is distinguished by its smaller size, clavate outline, the posterior region sometimes forming in the preparations a narrow moniliform appendage of many segments. The general surface is comparatively smooth under a lens, though studded with long clavate papillæ and encrusted with particles of sand which give a dull greyish appearance in life and in a state of preservation, with a dull bluish region from the intestine. The body-wall is thinner than in *S. plumosa* and the fasciculi of the dorsal and ventral longitudinal muscles are visible as separate strands. There are six branchiae, the two lower with filiform tips and devoid of a pale streak in the centre. Two minute brown pigment-specks occur on the process bearing the branchiae, the flattened and crenate palpi, and the mouth. The first series of frontal bristles are translucent, pale, iridescent, and, as compared with those of *S. plumosa*, few in number and boldly articulated. The second series inauguates the arrangement throughout the rest of the body, viz., a longer dorsal tuft of articulated bristles, and ventrally

* "Die bordensässigen Anneliden aus den Sammlungen der deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia,'" 1908.

a shorter yet conspicuous tuft—proportionally thicker with well-marked articulations and a tapered and slightly hooked tip.

The third species is *Stylarioides arenosa* of Webster, which was procured at low-water mark at St. Peter Port, Guernsey, in 1868—that is, long before it was seen by H. E. Webster between tide-marks, Northampton County, eastern shore of Virginia. Mr. Webster, however, first published a description of the species. The body is about two inches in length, firm and more or less rounded from a dense coating of adherent sand-grains, and in the preparations grooved anteriorly, either dorsally and ventrally, from contraction. It is slightly tapered anteriorly and gently diminished to a blunt tail with the anus in the middle. Segments 60–70, distinct. The first three sets of articulated bristles are longer than the rest, and with the next two directed forward, shorter than in *S. plumosa*, pale yellow and resplendent. The ventral of the third series shows a hooked tip with an adnate secondary process, and in its progress backward the edge of the latter is differentiated into a separate process, either by use or otherwise, and the whole flattened hook becomes shorter and more closely articulated.

The entire surface is closely beset with sand-grains, so that to the touch it resembles a hard sandy tube. The papillæ appear to be more or less cylindrical with a clavate tip, but they exhibit no evident arrangement in rows as in Mr. Webster's American examples. The branchiæ also appear to differ, for Webster states that they "are very numerous, filiform, red at the base, green externally, the inferior shorter than the superior."

As mentioned by the American author, the bristles of the first five segments point forward, but the first three are most conspicuous. The first is the longest, and its bristles are densely coated with parasitic growths, such as thecate Infusoria, algæ, mud, and fragments of bristles. The ventral are a little shorter than the dorsal. Though pale by reflected light they are brownish by transmitted light, taper to a very delicate hair-like tip, and have a series of articulations, which are closer at the base of the bristle, longer in the diminishing tip. The ventral of the second set are considerably shorter, have a double curve, and taper to a less delicate though simple tip which is slightly hooked. The ventral of the third series (Webster says fourth) consist of three bristles, curved at the tip and bifid, the tip indeed resembling that of *Sigalion* and *Sthenelais*. The terminal segment is about

three or four times as long as the adjoining, and ends in a hook with a secondary process in the form of a fixed process beneath—that is, in the concavity. Whilst only three of these organs project externally, seven occur in an even row in the tissues, but four are imperfectly developed. Of the three projecting externally, two are larger and more opaque (brownish), have short segments throughout their lower half, longer segments in their distal half, which is curved. The third bristle is considerably shorter, more translucent, and has long segments throughout its free portion, with short segments at its base in the tissues. The latter apparently represents a developing bristle. The dorsal bristles project upward and inward in a series of short fans to the posterior end of the body, the tips showing a tendency to curve forward. The ventral bristles from the third backward present a gradual modification into stout hooks with bifid tips. Thus at the 10th foot these processes retain a bristle-like appearance with long articulations, which, however, become shorter toward the tip, which tapers to a long terminal joint with a hook and a secondary process differentiated at its free edge, viz., with a thickened rim, but the whole is bound to the concavity of the hook. At the 20th foot a similar condition exists both as regards the bristle-like stem of the appendage, the shortening of the joints toward the tip, and the longer terminal joint with the hook and the fixed secondary process beneath with the marginal differentiation—the whole having the aspect of a Polyzoan avicularian. The hook gradually becomes shorter, broader, and stouter, the articulations more closely arranged, and between the 40th and 50th feet the secondary process has in some lost its web, so that the thickened edge, as it were, forms the mandible below the hooked beak. Toward the tip of the tail the secondary process of the now short hook often disappears and the terminal hook is considerably abraded. The hook is still flattened and has oblique striæ below the translucent tip. The reticulations are also very closely arranged.

Flabelligera affinis, Sars, is a common form all round the shores of Britain from Shetland to the Channel Islands, and is equally well known in Spitzbergen, Greenland, Iceland, and Scandinavia. It generally occurs between tide-marks or in the Laminarian region; though it also extends to the coralline zone. So far as observed, all the British examples are referable to the same species.

The last of the series is *Flabelligera buskii**, with a body about half an inch in length and the outline of a young example of *Flabelligera affinis*, both as regards gelatinous investment and the urn-shaped and clavate papillæ, but the former have a coarser central axis and the latter are smaller and have thicker stalks. The palpi are pale, whilst the body and branchiæ are bright red. The frontal bristles are translucent and delicate, and the articulations wide. The hooks, which are often in pairs, have slender shafts with longer articulations than in *F. affinis*, and the terminal claw is wider towards the base, is longer, and has a smaller angle with the shaft.

The Chaetopteridæ were introduced to the British Fauna by Dr. Baird in 1854, and thus only occupied a place in the "Addenda" to Dr. Johnston's posthumous 'Catalogue of the non-parasitic Worms in the British Museum.' No addition to the family has been made in the 'Fauna of Plymouth' (1904), but Mr. Cyril Crossland's † excellent résumé of the various species of *Chaetopterus* has done much to clear up the confusion in regard to them. Dr. Baird's specimens of *Chaetopterus variopedatus*, Renier, came from the south coast of England (Cornwall), but it ranges from Shetland to the Channel Islands, and occurs on both the eastern and western coasts as well as the shores of Ireland. Abroad it would seem to be the common form on the western and southern shores of Europe. The remarkable contour, brilliant bluish phosphorescence, and large tube often covered with zoophytes make it one of the most striking annelids.

The anterior region in the northern specimens of *Chaetopterus variopedatus* usually consists of the "head" and nine bristled segments. The so-called "head" forms a broad frill or collar, the great dorsal flaps of which cease at the base of the tentacles, a less conspicuous rim passing on each side to the middle line of the dorsum where fusion occurs. In the preparations of the northern forms, as in life, no anterior frill is present in the mid-dorsal line, and they thus differ from the Neapolitan examples, the dorsal band forming an enlargement and ending bluntly behind the oral rim. In the Neapolitan form the mid-dorsal line has a tendency to differentiation in the shape of a fold or thickening of the rim, and the termination of the mid-dorsal longitudinal band

* Trans. R. S. Edin. vol. xxv. p. 420, pl. xv. fig. 13 a, and pl. xvi. fig. 4.

† Proc. Zool. Soc. 1904, vol. i. p. 270.

is less expanded. The cavity of the collar, which, by the approximation of the dorsal flaps, assumes the shape of a funnel, leads to the mouth and is tinted brown, with a tendency to madder-brown near the oral aperture. It doubtless subserves important functions in alimentation. At its outer edge dorsally, and close to the first foot, springs on each side the large subulate tentacle, which in the preparations is grooved on its inner surface and shows crenations along the groove. Thus the organ resembles a palp, though apparently occupying a different position. In life it is capable of considerable elongation, and occasionally presents a coil or two towards the tip. At its base externally is a transversely elongated black pigment-speck—the eye,—which occupies a pit at the base of the collar and between it and the base of the tentacle. In some the black pigment-specks are separately arranged in a transverse row.

Closely following the buccal segment are the feet and other parts of the region, which has 9 segments in almost all the northern examples. In two specimens from Naples one had 10 on both sides, and the other 10 on the right and 11 on the left. Considerable variability, however, is known to exist in the common species, which may have only 8 bristled segments in this region. The feet are uniramous with the exception of the ninth. Whilst the dorsal surface is distinguished by its narrow median grooved band which is continued on the tenth segment, the ventral surface forms a large, convex, glandular, shield-like area—somewhat resembling that in *Sabellaria*,—and in the Neapolitan examples the area is more definitely outlined, probably from the method of preparation.

The next or middle region consists of 5 segments, though the first appears to pertain as much to the anterior region. This (first) segment has dorsally the median grooved band, which is of the same diameter as in front, but at the posterior edge of the wings it diminishes and is continued thereafter as an undivided smooth band. It is in this region, viz. in the eleventh segment, that the cylindrical faecal masses first appear, so that they may be formed in front of it. The inner surface of the gut is here thrown into a complex series of folds or large villi.

The posterior region has 22 or 23 strongly marked segments, each of which has a prominent dorsal division of the foot formed on the plan of the great wings of the tenth segment, viz., a large fleshy lobe somewhat tapered distally and enclosing a series of bristles of the type seen in the tenth bristled segment, tapered at both ends but

most attenuate at the distal end. This process ends in a ventral enlargement carrying on its anterior edge a band of hooks, each of which has about ten fangs. Besides, two flaps on the ventral surface carry hooks with ten or eleven teeth or fangs. Altogether there are thus four rows of hooks in each segment, and the individual hooks vary little in the several rows. The dorsal processes gradually diminish posteriorly and end in two small and somewhat lanceolate processes on each side and below the level of the anus.

The three great lamellæ on the dorsum of the middle region of the body are waved to and fro, as if performing a respiratory function either for blood or coelomic fluid. Their muscularity is considerable, so that a vigorous fanning motion from front to rear is caused.

What apparently is a *Spiochætopterus* was dredged in Loch Linnhe on the 7th September, 1882, in 35-37 fathoms, and similar tubes come from various parts of the British shores. The tube is rigid, hard, and brittle, breaking under the forceps like the ossific tissue of young teleosteans and in short fragments. Somewhat faint rings encircle the tubes, but the intervals are not quite regular. The anterior end of the annelid is absent. Each segment has dorsally a pair of setigerous processes bearing a group of about four bristles, with long shafts and flattened tapering tips. Two flap-like processes occur on the side below the foregoing and bear hooks which are exceedingly transparent and the outline of which is difficult to follow. They appear to approach those of *Spiochætopterus*, a form whose range extends to both sides of the Atlantic.

5. On the same Families dredged in the 'Porcupine' Expeditions of 1869 and 1870.

A species about the size of *Stylarioides glauca* is *Stylarioides flabellata* of Sars (Pl. XII. fig. 1), which was dredged in the 'Porcupine' Expedition of 1870 on the Channel Slope at Station 6, 48° 26' N., 9° 44' W. in 358 fathoms. It is readily distinguished from *S. glauca* by the dense coating of sand-grains, by the ferruginous hue of the posterior region, the stronger frontal bristles, and the conical anterior process with its long papillæ. The body is rounded, about an inch in length in the preparations, slightly enlarged at the anterior third, and gently tapering to the posterior end, which forms a short cone with the anus in the centre.

Anteriorly the dorsal median process bears long papillæ with globular or clavate tips, which give it a characteristic fringe under a lens, and on each side is the long pale bristle-tuft which proceeds forward and very slightly outward and upward, the tips having a ventral curvature. They are finely iridescent, gleaming with a greenish-blue sheen like the long bristles of *Mitraria*. When mounted in Farrant's solution they are brownish by transmitted light, have short articulations at the base, but the greater part of the free portion in each has long joints. They taper to a fine point, show a distinct curvature, and are somewhat stiff. They form an even row or palisade in the tissues, with reserve bristles developing at the base, and make a regular vertical fan-like series internally. The ventral bristles are only a little shorter, the regularly arranged fan being directed slightly outward and forward, the lower bristles having a ventral direction, and the tips curve inward. The angle these bristles make with the body is variable, according to the condition of the basal muscles on immersion in spirit. The bristles of the second foot—which is fused with the first in forming the lateral projection on each side anteriorly—are much shorter and more slender than the first, indeed the dorsal do not appear to be half the length, and the ventral are still shorter. Their direction is also forward and slightly outward and their structure is the same, viz., long, tapering, jointed bristles. The bristles of the third foot leave the body at a different angle—projecting more directly outward and slightly forward. The dorsal series has the same structure, but the ventral differ, for they are long, jointed, flattened, nearly of equal diameter throughout, though really slightly increasing from the base to the end of the shaft, which is a little dilated and curved forward. The tip consists of a gradually diminishing flattened process, ending in a well-marked hook (Pl. XII. a. fig. 1), the whole structure being more conspicuous *in situ* than the slender tapering dorsal bristles.

The posterior hooks are short and knife-shaped with a marked curve at the tip (Pl. XII. a. fig. 2), and have oblique striae throughout.

Another species, which may provisionally be termed *Stylarioides sarsi*, was dredged in the 'Porcupine' Expedition of 1870 off Cape Sagres in 45 fathoms, on July 28th, amidst what was termed a southern fauna. It somewhat resembles *Stylarioides plumosa*, but has a shorter anterior region, fewer segments, more velvety surface, and stiffer dorsal bristles, the

ventral of the third pair forming long stiff straight bristles, whilst the hooks of the fourth pair are short, broad, flattened knives with a curve at the tip. This form of crotchet continues a short distance and passes into a series of longer, rigid, lever-like spines posteriorly.

So far as the two fragments, apparently of the same animal, show, the shape is generally that of the common species, the entire surface being closely villous from clavate papillæ, which are longest on the first three segments, and especially the first, but no sand-grains are visible. The general colour is a kaki-brown, and the segments are more than 20 in number. The papillæ are smaller on the ventral surface, and, as on the dorsum, they are more conspicuous on the anterior segments. The anterior pit for the emission of the oral organs is triangular and resembles in position that of *S. plumosa*. The first foot has long, pale golden, iridescent bristles, which in the preparation pass forward and inward, so that they cross each other toward the tips, which show only a trace of a curve. They and the next two groups are studded with *Loxosomæ*, which extend likewise on the foot at the base and present buds at various stages. In structure the dorsal bristles (Pl. XII. a. fig. 3) have narrow segments at the base and for a long distance outward; then toward the tip the segments increase in length but irregularly, two, three, or four short segments being followed by a longer one, and so on to the delicately tapered tip. In some instances the smaller segments are incomplete, the lines running inward only partially. The ventral of the first set are a little shorter, but show the same structure. The dorsal and ventral bristles of the second and third groups are shorter, and the ventral of the third have increased in strength, forming a stiff fan of rather long bristles which spread upward and inward, so that much of the fan is seen from the ventral surface. They taper from base to apex, and the segments increase gradually in length toward the tip, which is generally abraded, apparently from use in the tunnel in the mud. The fourth foot has slender dorsal bristles, and ventrally a row of stiff flattened hooks (Pl. XII. a. fig. 4) with closely articulated shafts, and broad flattened tips shaped like a hedge-bill with a well-marked hook. Oblique striæ occur as the transverse lines wane. Besides these is a form simply curved like a tapering spatula and having articulations nearly to the tip. The dorsal bristles form somewhat stiff fans directed obliquely forward and upward to the posterior end of the fragment. The ventral hooks, again, remain only for a short distance of the broad knife-shape,

becoming more elongated posteriorly (Pl. XII. a. fig. 5), a typical foot there showing about five ringed hooks with a slight curvature of the shaft and ending in a point, generally abraded, and with only a trace of a curvature near the tip. They would thus act as lever-like spines, whilst the anterior crotches are more fitted for clinging.

The distinctions between *Brada* and *Stylarioides* do not rest on the absence of the frontal bristles as De Quatrefages states, for the first and second pairs of dorsal bristles, though short, are in *Brada* fairly conspicuous. Moreover, one section of the genus, viz. that represented by *Brada villosa*, H. Rathke, leans closely to *Stylarioides*, especially that group with more or less straight ventral bristles, yet they are distinguished by the papillæ between the fourth and fifth bristled segments in *Brada*—even in the elongated type with 45 segments. The setigerous process for the ventral bristles is more distinct in *Brada*, and may show a circlet of papillæ at its base. The palpi and numerous branchiæ characterise *Brada*, as well as *Stylarioides*. In *Brada* the ovaries form dense clusters in the sixth, seventh, and eighth bristled segments and behind the papillæ.

A variety of *Brada villosa*, H. Rathke, was dredged in the 'Porcupine' Expedition of 1870 at Station 8 on the Channel Slope in 257 fathoms, amidst a northern fauna, and it was also dredged in the 'Knight Errant' on the 17th August, 1880, at a depth of 580 fathoms at Station 8. It measures about 2 inches in length, and is distinguished by its hirsuto sandy aspect and the shortness and delicacy of its bristles. The anterior end is bluntly rounded and the feeble development of the frontal bristles is, for instance, in contrast with those of *Stylarioides plumosa* and indicates a difference in surroundings, the present form probably inhabiting soft mud in deep water. The anterior pit has a broad arch superiorly, the margin being papillose, whilst the posterior lip is deeply sinuous ventrally, the whole forming a large opening with a broad projecting rim ventrally. In this aperture lie the two crenate and grooved palpi and above them the slender branchiæ. The body is fusiform, tapered anteriorly and more distinctly posteriorly, where it ends in a bluntly conical tail with the anus in the centre. Three diminishing smooth rings occur behind the last segment bearing bristles. The dorsum is rough with long papillæ and sand-grains, which on the ventral surface are smaller, thus rendering the enlarged anterior region smoother, and the same may be said of the posterior half. Both offer a contrast to

the rough dorsal surface. The bristled segments are in the large example 46 in number. The frontal bristles of the first pair are very slender and inconspicuous, and do not extend forward the breadth of the body. They are pale, tapering bristles, with long joints and very fine hair-like tips. The dorsal bristles of the second series are still shorter and equally slender. Those of the third series agree, but the ventral have assumed the characteristic stout shafts and finely tapered translucent tips seen in rest of the body (Pl. XII. a. fig. 6). They arise from a smooth conical setigerous process with long clavate papillæ at the base. The prominence of the ventral division of the foot throughout the body is noteworthy. Between the fourth and fifth segments ventrally is, on each side, a cylindrical or slightly flattened papilla with a smoothly rounded free end, the lower half apparently having a coating of sand-grains. It varies in length in the females, some having long and others short papillæ.

This form has certain resemblances to the *Siphonostomum villosum*, of H. Rathke *, though his examples were small and short, probably incomplete. The special characters of the ventral division of the foot and the somewhat stellate arrangement of the papillæ around each, when viewed on end, generally correspond. Unfortunately he did not enter into the minute structure of the bristles or figure them. Moreover, it agrees closely with *Trophonia arctica*, Hansen †, from a depth of 20 fathoms in Magdalena Bay. He, however, describes the dorsal surface as uniformly granulated, and the papillæ on the ventral surface as fewer and smaller. On the whole, Hansen's form is smoother.

There are apparently two varieties of *Brada villosa*, viz., the shorter northern form and the more elongated type from the 'Knight Errant.' Both have the dense coating of sand-grains which, with the papillæ, make the dorsum remarkably rugose, yet there are considerable differences in the shorter northern forms from Finmark, some of which are much less covered with sand. Both have the ventral papillæ exactly in the same position and of like shape, yet amongst those from Greenland and from Finmark the length of these papillæ varies, some having short, others long papillæ, so that sexual distinctions in this respect may exist. The number of segments in the shorter northern form is about 23, whereas the specimen from the 'Knight Errant' has 45.

* Beiträge zur Fauna Norwegens, p. 215, pl. xi. figs. 11 & 12.

† Norske Nördhava-Exped. Annal. p. 39, pl. vii. figs. 17-20.

The bristles of the two series agree in structure, though it must be stated that the long example from the 'Knight Errant' has dorsal and ventral bristles of a more slender character than the northern, and they are paler, and further that the papillæ are longer and more slender both dorsally and ventrally. In this specimen also from the 'Knight Errant' a parasitic Infusorial form allied to *Carchesium* projects from the anterior pit.

6. On the foregoing Families dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.

An example of the Sphaerodoridæ, viz. an *Ephesia*, offers certain differences from the ordinary British and northern form (not the southern), in so far as it presents a distinctly articulated tip to its bristles, which, besides, have an enlarged end of the shaft with an oblique continuation, as in the Syllidæ, the terminal piece, which tapers to a sharp point, being frequently lost. It thus presents a close resemblance to *Lephisia antarctica**, McL., from the Antarctic Circle, as first procured by the 'Challenger,' and more recently, described by Prof. Ehlers †, by the German exploring-ship 'Valdivia,' though the bristle shows no spikes on the bevelled margin of the end of the shaft—a condition, however, which is very easily altered by friction.

The Chloræmidæ are well represented by good examples of *Stylarioides plumosa*, O. F. M., one of which had a parasitic crustacean attached to a branchia, the elongated body like an ovisac projecting nearly as far as the tips of the branchiæ. A variety dredged in considerable numbers in 125 fathoms off Cape Rosier Lighthouse has a comparatively smooth surface, for the papillæ are very minute and few or no foreign particles are adherent. This form has normal bristles and hooks, whereas another variety with the roughly papillose dorsal and ventral surfaces has longer and more slender ventral crotchets, whilst the dorsal bristles are also somewhat longer, and in this respect it agrees with a similar variety procured by H.M.S. 'Valorous.' Whether the soft reddish mud of the region favours this tendency to a smoother surface of the first-mentioned is unknown, but the condition is noteworthy. In one instance the body is quite pale throughout and has no trace of the fine reddish mud. *Braga*

* Annel. 'Challenger,' p. 361, pl. xliv. fig. 5, and pl. xxii. A. figs. 22 & 23.

† 'Die bodenässigen Anneliden, &c.' p. 107, tab. xiv. figs. 7-13 (1908).

villosa, H. Rathke, likewise occurs, and an example about $\frac{8}{9}$ of an inch in length is so free from sand that the papillæ are clearly visible on the pale yellowish-brown surface. This species shows considerable variety in external appearance, but the bristles and crotchets remain distinctive. The *Trophonia arctica* of Hansen does not appear to differ materially from this form.

The only example of the Chætoptéridæ is the widely distributed *Spiochætopterus typicus* of Sars, tubes of which occur in 96 fathoms in Trinity Bay, Saguenay County, as well as a fragmentary form at Station 4, 1872.

7. On the same Families dredged in Norwegian Waters and in Finmark by Canon Norman.

The rich collections of Canon Norman from northern waters include examples of *Stylarioides plumosa*, O. F. M., off Bergen, Christiania, and other localities, as well as from Finmark, but they are comparatively small in contrast with the British specimens, the finest of which occur between tide-marks. An abundant northern form is *Stylarioides glauca*, Malmgren, and one still more characteristic of Norwegian waters is *Stylarioides flabellata*, Sars, which is found in great beauty. From Finmark come *Brada villosa*, H. Rathke, *Brada granulata*, Malmgren, and another which differs from both. Average examples of *Flabelligera affinis*, Sars, are not uncommon in the Norwegian Fjords.

A species, *Stylarioides hirsuta*, Hansen, dredged at Stations 74 and 84 in Finmark in 1890, appears to correspond closely, so far as can be made out from the brief description and figures, with *Trophonia hirsuta* of Hansen*. The incomplete body is about half an inch in length, somewhat clavate in outline, and with 17 bristled segments. The colour is dull yellowish or ochre, with the clavate papillæ of the first two segments of a reddish brown and forming two rings, whilst a little of the same pigment occurs on the next six or seven feet. The dorsal surface (Pl. XII. fig. 2) is clothed with remarkably long papillæ, so as to be woolly, especially posteriorly. On the ventral surface the papillæ are comparatively short, especially on the dilated anterior region. About 17 bristled segments are present. The first segment is marked by an ellipse of the reddish-brown papillæ and certain much longer pale papillæ, as well as by the somewhat slender and short tufts of golden

* Op. cit. p. 38, pl. vii. figs. 5-8.

Prof. M'Intosh's Notes from the *

bristles, which pass forward and slightly upward across each other in the preparation. They taper from the base to the hair-like tip, the former, however, showing a slight constriction near the skin, and they have very distinct and rather long articulations, the aspect being such as would be caused by a bevelled edge at each articulation. The ventral bristles (Pl. XII. a. fig. 7) are not half the length of the dorsal series, but they are considerably stiffer, with narrow segments at the slightly contracted base, and very distinct longer articulations beyond these. They taper to an acute point with a faint hook, probably from the mode of preservation. The next six or seven feet have similar bristles both dorsally and ventrally, the former being directed for the most part upward and forward, the latter often outward and slightly backward. The narrower part of the body is especially hirsute from the long papillæ and the long bristles.

The description and figures of Dr. Hansen agree in the main with the foregoing, though there may be some room for doubt. The brownish colour of the ventral bristles is not conspicuous.

Marenzeller is doubtful whether *S. hirsuta* is not a variety of *S. glauca*, and both have four larger and four smaller branchia.

Stylarioides normani.

A form (Pl. XII. fig. 3) distinguished by its comparatively small size, nearly cylindrical body, short papillæ somewhat closely covering the dorsum, well-marked feet with papillæ and the ventral bristles of which are only a little shorter and stronger than the dorsal, comes from Station 49, 1890. The body is pale yellow, and under a lens its surface appears to be devoid of sand-grains, but very minute particles of sand and débris are seen under the microscope on the surface of both body and papillæ.

The anterior end is slightly tapered, abruptly truncated anteriorly, and the edge papillose. The bristles of the first series are of moderate length, slender, and pass nearly straight forward. The dorsal bristles of the third series also remain of considerable length and pass upward and forward. The ventral are shorter and stronger, and form a fan nearly transverse in direction. Behind the foregoing the dorsal bristles do not become shorter, whilst the ventral (Pl. XII. a. fig. 8) distinctly increase in length and are directed outward and slightly backward. The transverse articulations of the dorsal bristles are characteristically faint. The clavate papillæ of

the dorsal lobe are longer than those of the ventral. The ventral bristles are distinguished by their greater diameter, stiffness, and slightly deeper yellow as transparent objects. Their transverse articulations are much closer proximally than distally, and the tip is very slender. This may be a well-marked variety of the former.

Another member of the family is *Brada granulata*, Malmgren, from Finmark in 1890. This differs from *B. villosa* in its shorter form in proportion to its breadth, in the less developed bristles, the absence of the ventral papillæ, and in the apparent absence of sand-grains, though under a microscope minute grains are numerous. The body is somewhat fusiform, rather blunt at each end, especially anteriorly, the segments clearly outlined and dotted all over with pustule-like papillæ, the ventral not evidently differing from the dorsal surface in this respect. Segments 24, the first having the trifid pit anteriorly and the last a vertical fissure for the vent. The dorsal bristles are only visible after minute inspection, and they are pale, slender, and capillary, few in number, and with long joints. The first series is inconspicuous. On the other hand, the ventral division has a distinct setigerous process surrounded by a rosette of from seven to eight or more of the pustule-like papillæ. The ventral bristles are long and strong, minutely striated transversely, of a deep brownish colour, and ending in a pale yellow tip with a long curve and a hook-like curvature at the tip (Pl. XII. a. fig. 9).

Brada normani.

A form (Pl. XII. fig. 4) having the outline of *Brada granulata* with the anterior pit terminal and of a triradiate form, and with nearly the same number of segments, viz. 24, differs from it in having a surface quite as rough as in *B. villosa*—that is, covered with coarse sandy papillæ. Posteriorly a dimple which extends to both dorsal and ventral edges has the anus in its middle. The papillæ along the line of the dorsal bristles are large, long, flattened, and conical, with an acute tip (Pl. XII. fig. 5), and therefore of a type quite different from the papillæ usually seen in *Styliarioides*, *Brada villosa*, or *B. granulata*. They have an opaque granular and fibrous core, and it tapers in consonance with the outline of the process and ends in a median terminal strand which passes to the narrow and hollow as well as differentiated tip of the organ. Other and smaller twigs appear to branch into the hypoderm at the base of the narrow

terminal region. The translucent vacuolated hypoderm (or other tissue) surrounds this fibrous axis, and its strands occasionally give a quasi-pinnate aspect to the structure. Some of the papillæ have black pigment-grains scattered near the tip and thinly for some distance downward, but they do not seem to have any definite arrangement. Occasionally a short cylindrical mass is extruded at the tip, the distal end having a globular body within a sheath, and the basal having a central tubular connexion with the tip of the papilla. A thin cuticle envelops all, and it is thicker on the narrow terminal part of the papilla. The cylindrical tip is often truncated, the terminal fibres occasionally projecting beyond it. No other termination to the process has yet been observed. Sand-grains adhere to the bases and sides of these organs, the exact nature of which is still *sub judice*. Other papillæ of the ordinary clavate character and coated with sand-particles are also present on the general surface.

The dorsal bristles are few in number, some bundles consisting of two, inconspicuous and slender. They are pale delicate bristles, with closely arranged articulations at the base, somewhat irregular longer ones in the shaft, whilst the joints increase in length toward the finely tapered tip. These bristles are situated close to the ventral series and in the line of the acuminate papillæ. The dark yellow ventral hooks (Pl. XII. a. fig. 10) are of great length and nearly of equal breadth to the commencement of the pale tip, and crossed by closely arranged striæ which are slightly oblique. These disappear toward the translucent tip, which, as it narrows, bends backward, and then, with a bold forward curve, ends in a hook. The great length and linear arrangement of these organs must give them considerable power, especially when their own muscles and those of the remarkably unmuscular and tough body-wall are considered. The setigerous lobes supporting the ventral bristles are much less distinct than in *B. granulata*, very few presenting the rosette-like arrangement of the papillæ of that form, the ventral division generally being enveloped by the irregular lobate sandy masses projecting from the surface. This does not seem to be the *Brada inhabilis* of H. Rathke.

The question may be raised as to whether this form is not a variety of *Brada granulata*, Malungren, but the approximation of dorsal and ventral divisions of the foot and the structure of the tip of the ventral hooks, which in some are peculiarly attenuate, almost probe-like, distinguish it. Again, if the flattened papillæ should, on further investigation, be found to be adventitious, then separation would be less necessary.

EXPLANATION OF THE PLATES.

PLATE XII.*

Fig. 1. *Styliroides flabellata*, Sars, from the dorsal surface. Enlarged under a lens.

Fig. 2. *Styliroides hirsuta*, Hansen, viewed from the dorsal surface. Enlarged.

Fig. 3. *Styliroides normani* (an var. *S. hirsuta*?), sp. n., viewed dorso-laterally, so as to show the length of the bristles. Enlarged under a lens.

Fig. 4. *Brada normani*. Enlarged.

Fig. 5. Peculiar papillæ (?) along the line of the dorsal bristles of the foregoing, showing a central fibrillated core and a peculiarly modified tip. The base of a second papilla lies to the left of the figure. $\times 180$ diam.

PLATE XII. a.

Fig. 1. Ventral bristle of *Styliroides flabellata*, Sars. $\times 350$ diam.

Fig. 2. Posterior hook of the same species. Similarly magnified.

Fig. 3. Basal portion of dorsal bristle of *Styliroides sarsi*. $\times 350$ diam.

Fig. 4. Ventral hooks of the fourth foot of the same form. Similarly magnified.

Fig. 5. Posterior hooks (ventral) of the foregoing form. Similarly magnified.

Fig. 6. Ventral bristles of the third series of *Brada villosa*, H. Rathke, var. $\times 350$ diam.

Fig. 7. Ventral bristle of *Styliroides hirsuta*, Hansen. $\times 350$ diam.

Fig. 8. Ventral bristle of *Styliroides normani*. $\times 90$ diam.

Fig. 9. Ventral hook of *Brada granulata*, Malmgren. $\times 350$ diam.

Fig. 10. Ventral hook of *Brada normani*, an var. *B. granulata* (?). $\times 350$ diam.

LXXIII.—*On a Collection of Bats from Yola, Northern Nigeria, collected by Mr. G. W. Webster.* By Guy DOLLMAN, B.A.

THE British Museum owes to the generosity of Mr. G. W. Webster a collection of bats from Northern Nigeria, and, being the first collection received from this region, it proves of very great interest. In addition to some extremely rare bats, it contains one new species, and there can be little doubt that when the Nigerian fauna is thoroughly worked out many other new forms will be discovered.

1. *Eidolon helvum*, Kerr.

♀. 8. Yola.

2. *Hipposideros caffer guineensis*, K. And.

♂. 10, 12, 13. Yola.

These three specimens are all lighter in colour than any

* I am indebted to the Carnegie Trust for figs. 1–4 in this Plate.

others in the collection ; but this is probably due to the fact that they are immature.

3. *Lavia frons*, E. Geoff.

♀. 14, 2. Yola.

4. *Scoteinus schlieffeni albiventer*, Thos. & Wrought.

♀. 17. Yola.

It is interesting to find this bat so far west as Nigeria, the type specimen being described from Naikhala, Upper Egypt.

5. *Scotæcus albofuscus*, Thos.

♂. 15. Yola.

This is the first dry skin of *S. albofuscus* that the Museum has received ; the other three specimens in the collection, including the type, are all preserved in spirit.

6. *Chærephon websteri*, sp. n.

♀. 5, 11. Yola.

Allied to *C. gambianus*, de Wint., but smaller and with more fully developed upper anterior premolars, measuring 7 mm. in height.

In addition to these two Yola specimens, there are ten other Nigerian individuals in the collection which may be referred to this new species. The difference in size between this Nigerian species and the Gambian one is shown in the tabulated list of measurements given below :—

	Locality.	Length of forearm.	Greatest length of skull.	Zygomatic breadth.
<i>C. websteri.</i>				
Type, ad. ♀ ..	Yola, N. Nigeria.	mm. 34·5	mm. 15·4	mm. 9·4
Imm. ♀ ..	" "	34·5	No skull.	
Ad. ♂ ..	Lagos, S. Nigeria	34·7	15·7	9·6
Ad. ♀ ..	" "	34·5	15·8	9·7
Ad. ♂ ..	" "	35·2	15·7	9·7
Ad. ♂ ..	Boussa, Nigeria.	36	15·9	10
Ad. ♀ ..	" "	35·5	15·8	9·9
<i>C. gambianus.</i>				
Type, ad. ♂ ..	Bathurst, Gambia	.39	16·7	11·2
Ad. ♀ ..	" "	40	...	

Dimensions of the type (measured in flesh) :—

Head and body 55·5 mm.; tail 24; hind foot 5·5; ear 12.

Skull: greatest length 15·4; zygomatic breadth 9·4; length of upper cheek-teeth from front of second premolar to last molar 4·7.

Hab. Yola, N. Nigeria.

Type. Adult female. B.M. no. 8. 10. 6. 8. Collected 27th July, 1908.

There is no doubt that this Nigerian form must be recognized as distinct from the Gambian species both on account of its smaller size and larger upper anterior premolars.

I propose to call it *Chærephon websteri*, after the donor of the collection.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 20th, 1908.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

'On some Fossil Fishes discovered by Prof. Ennes de Souza in the Cretaceous Formation at Ilhéos, State of Bahia (Brazil).' By Arthur Smith Woodward, LL.D., F.R.S., F.L.S., V.P.G.S.

This paper proves that the Lower Cretaceous formation of Bahia extends along the coast, to a point at least 130 miles south of the area previously described. The fish-remains are referable to new species of the genera *Mawsonia*, *Lepidotus*, and *Scombrochipea*. *Mawsonia* seems to have been scaleless, and differs from all known Jurassic and Cretaceous Coelacanth fishes in lacking denticles on the fins. The *Lepidotus* closely resembles the European Wealden *L. Mantelli* in proportions, but is more strongly ornamented. The *Scombrochipea* is peculiar, in exhibiting only scales where the anal finlets usually occur.

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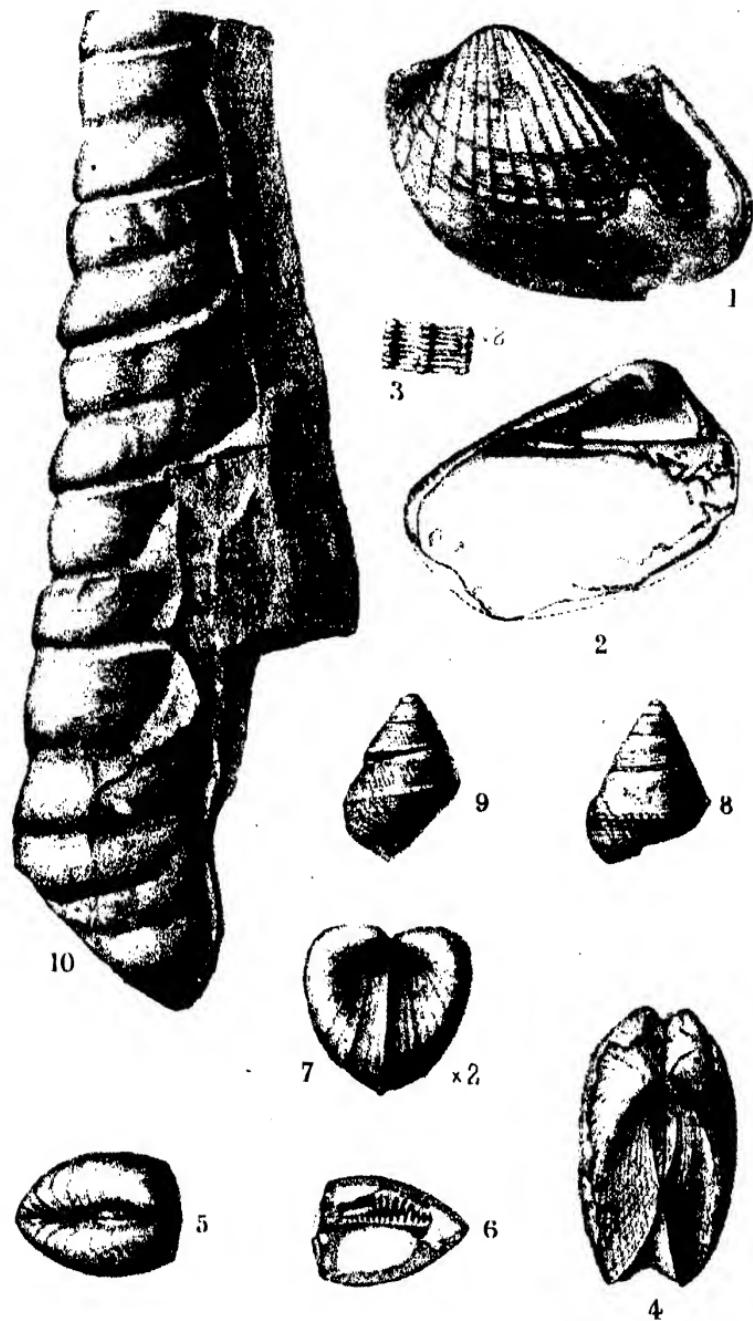
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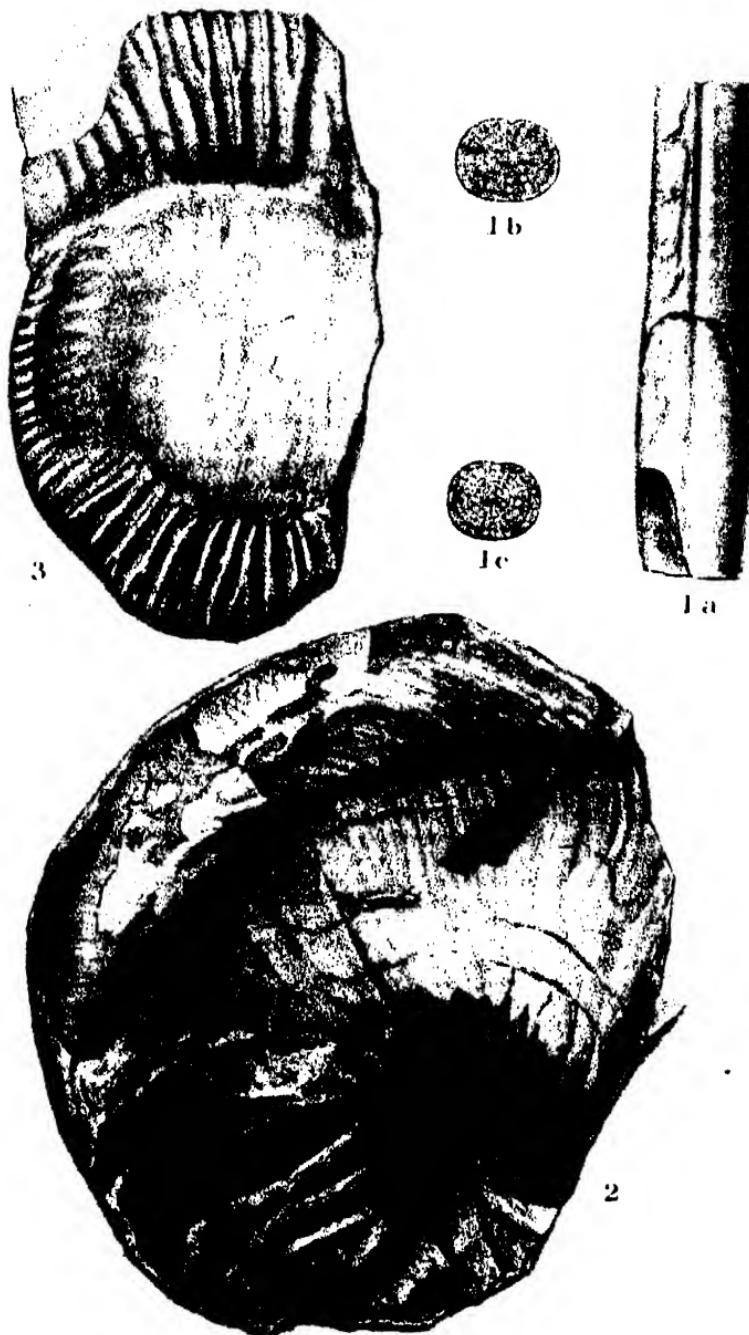
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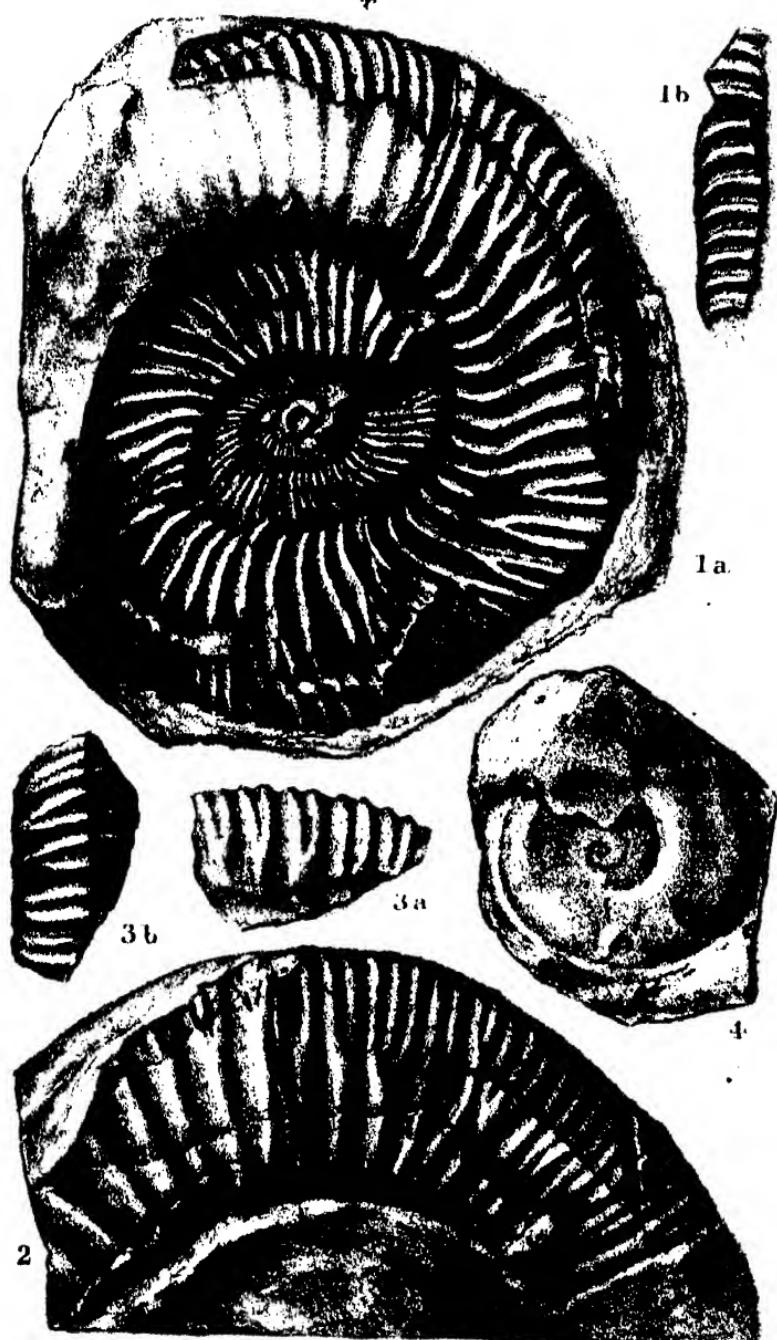
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ARABIAN JURASSIC CEPHALOPODA.



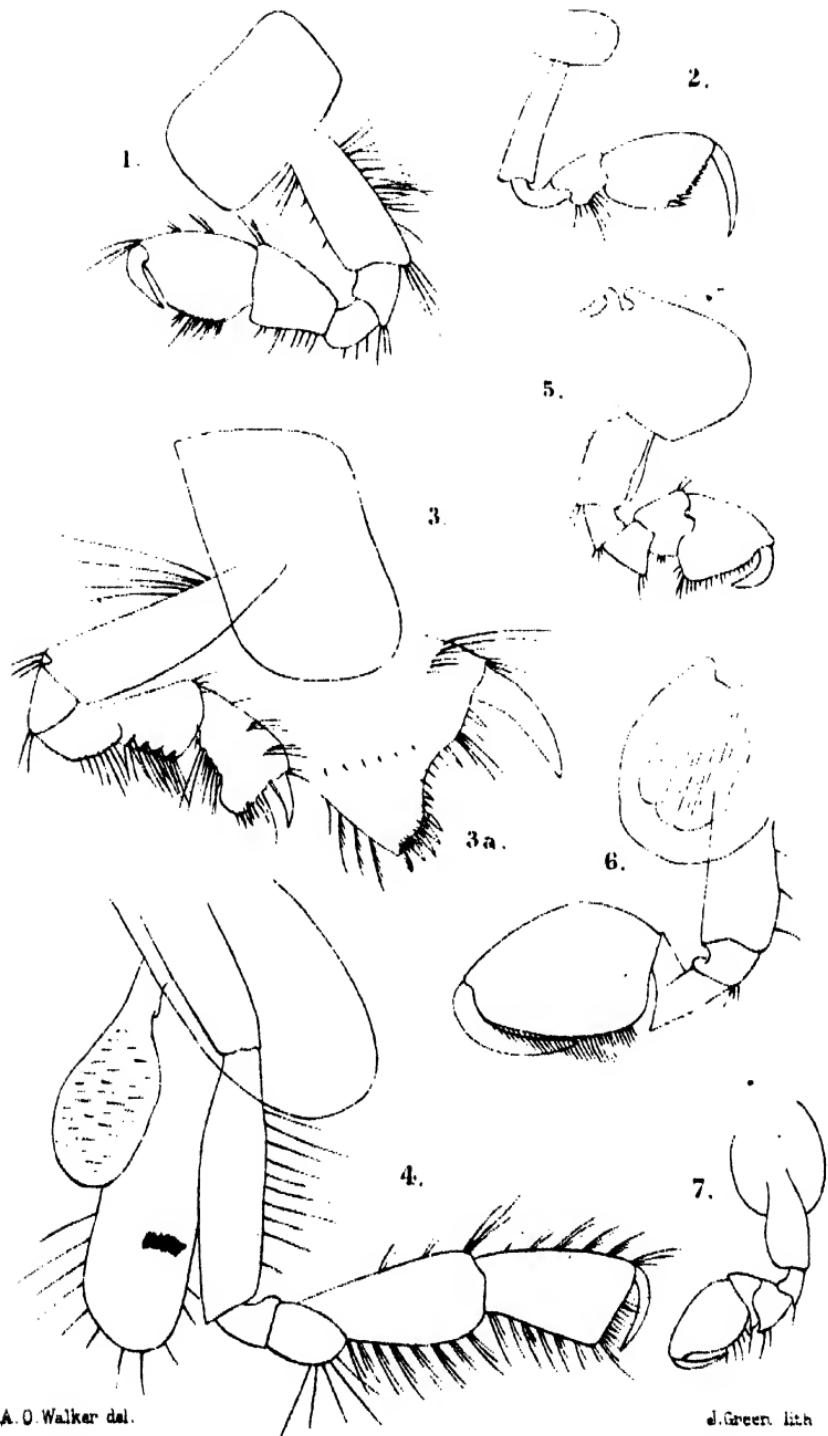
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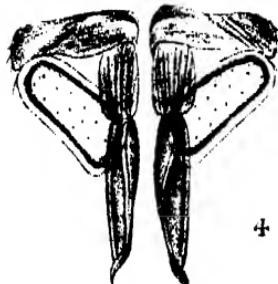
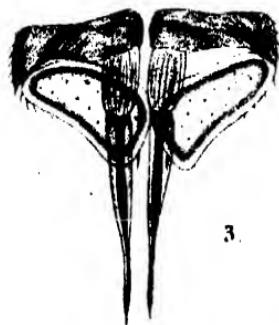
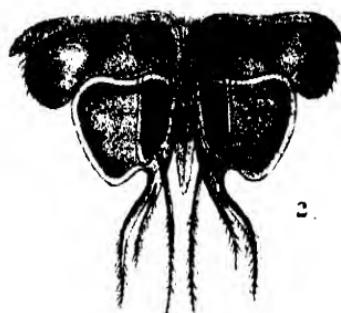
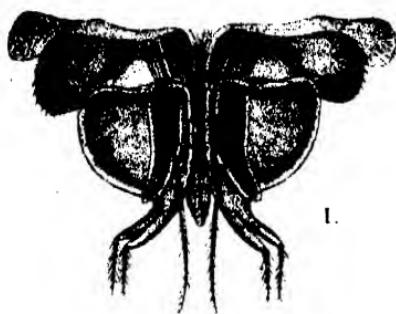
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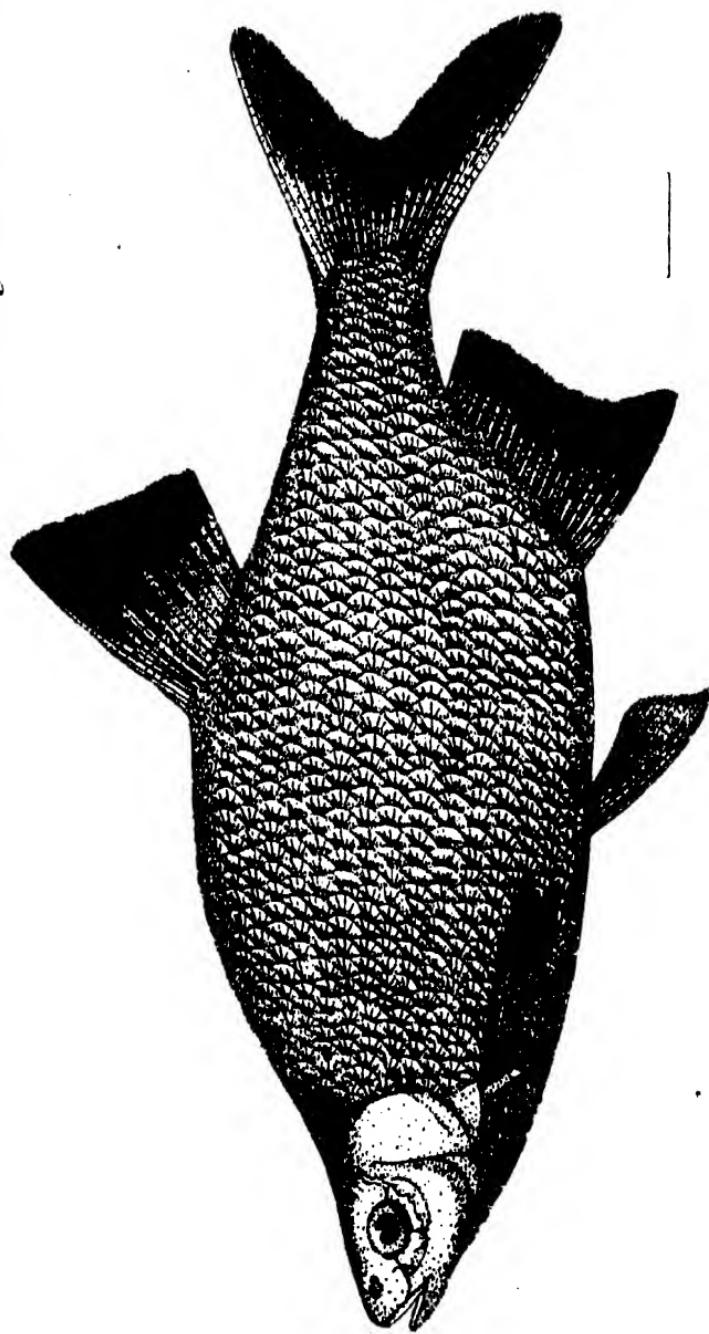


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MOLGE MACROSOAMA.

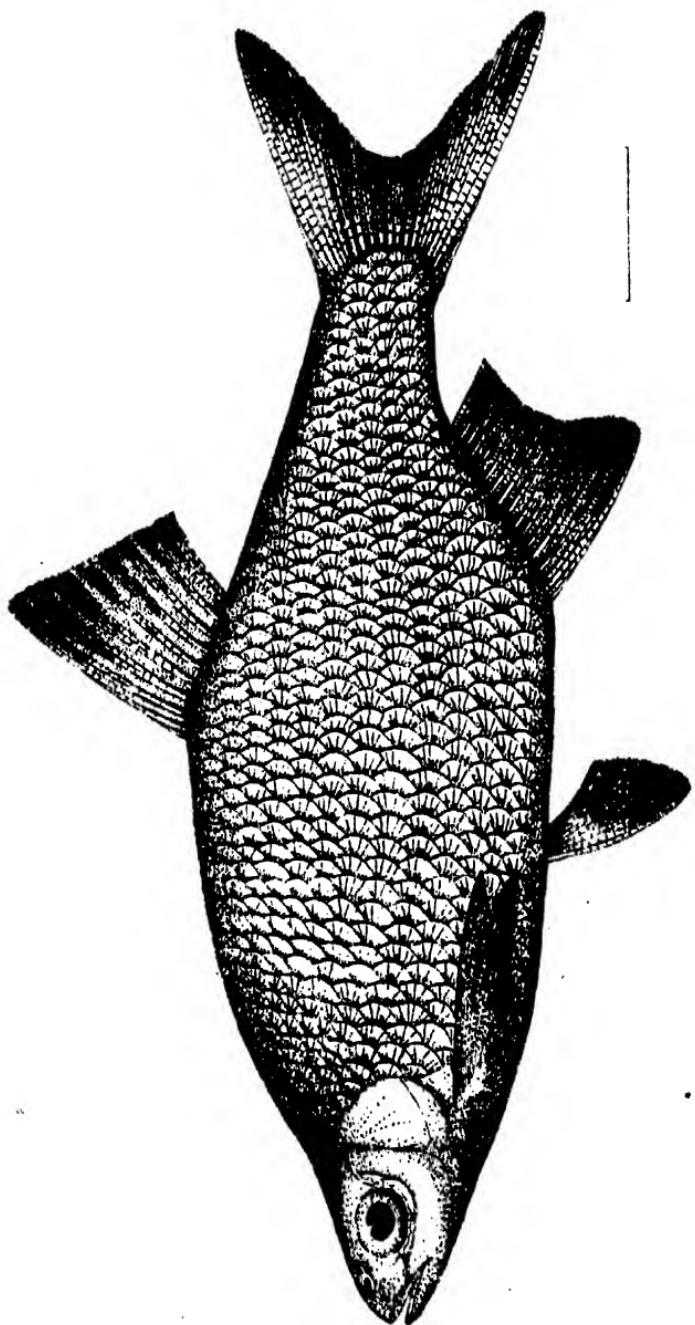






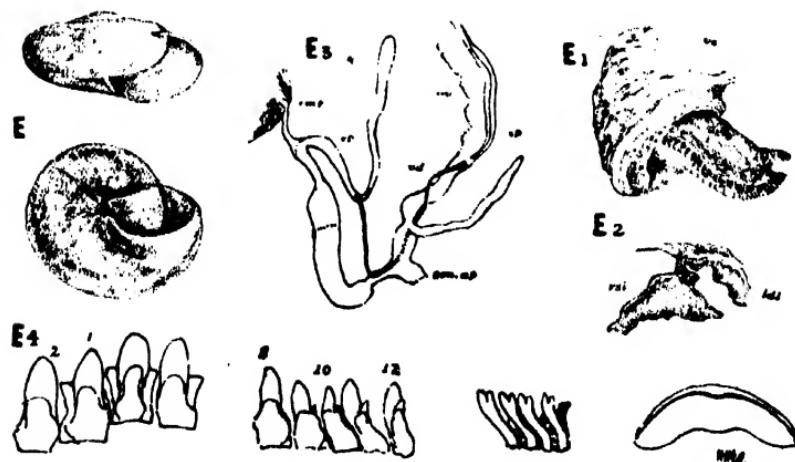
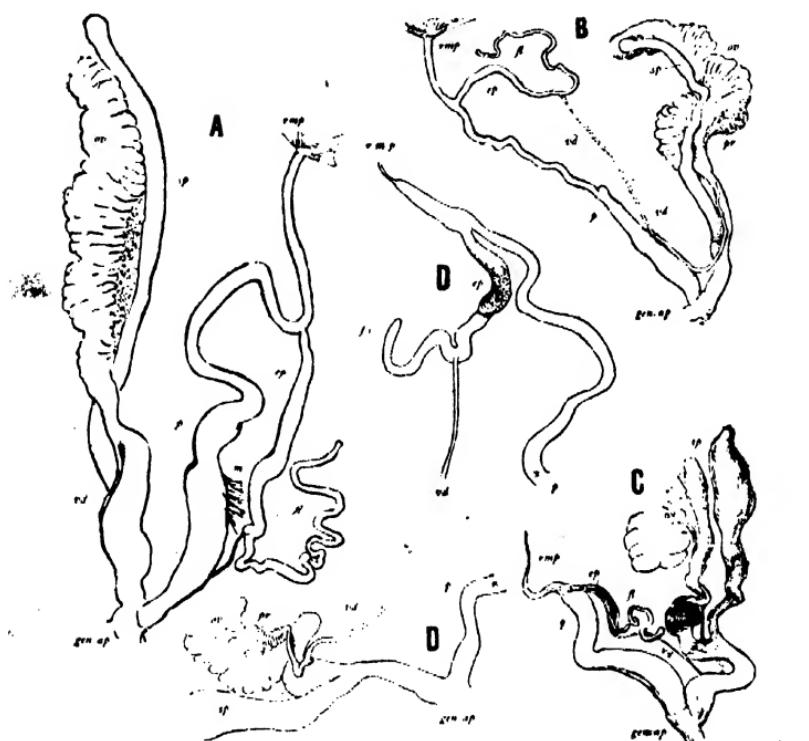
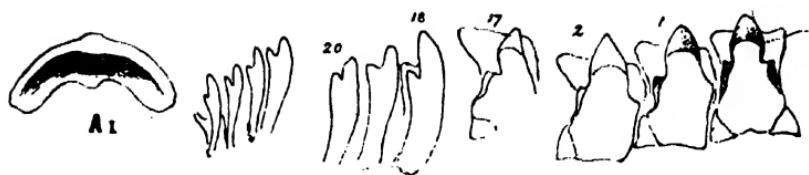
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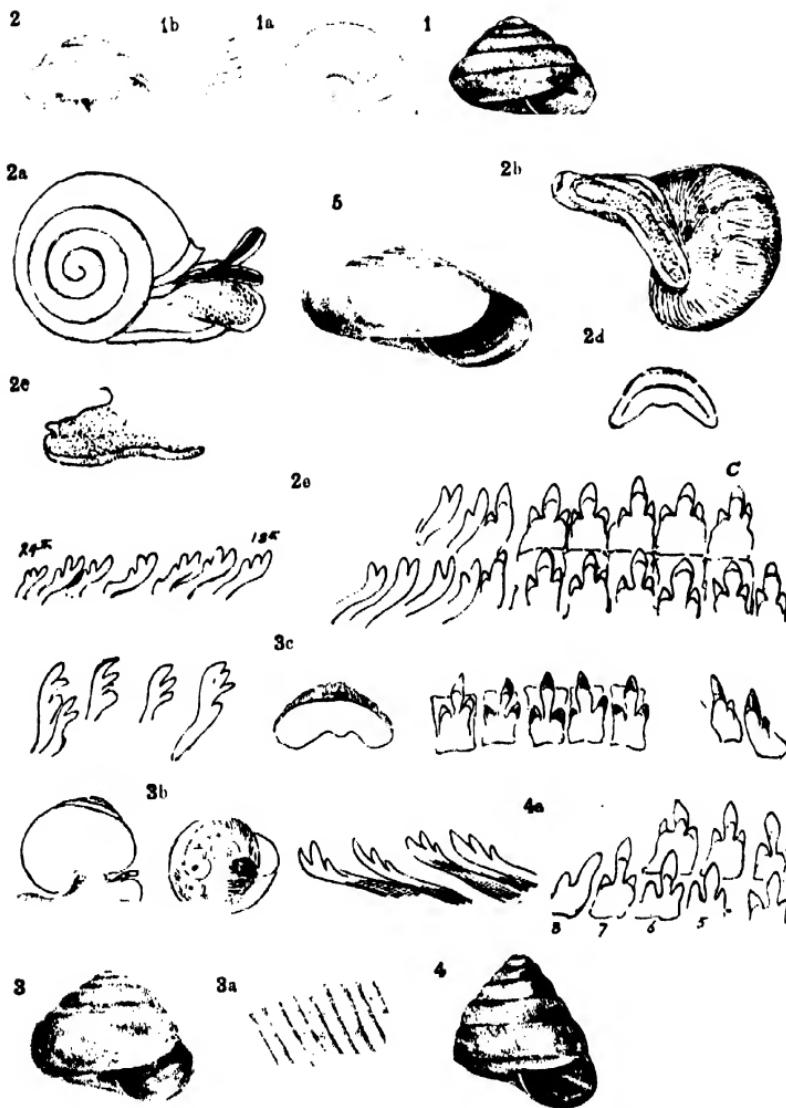
HYBRID BREAM AND RUDD.
Abramis brama X *Leuciscus erythrophthalmus*.

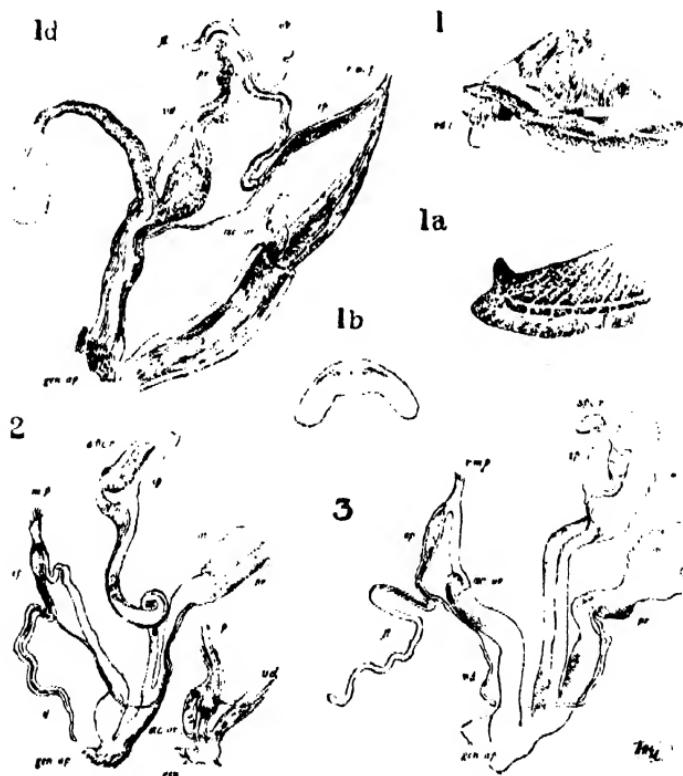
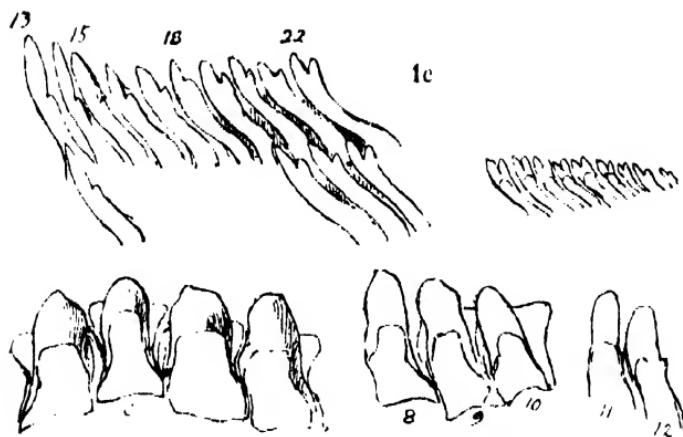


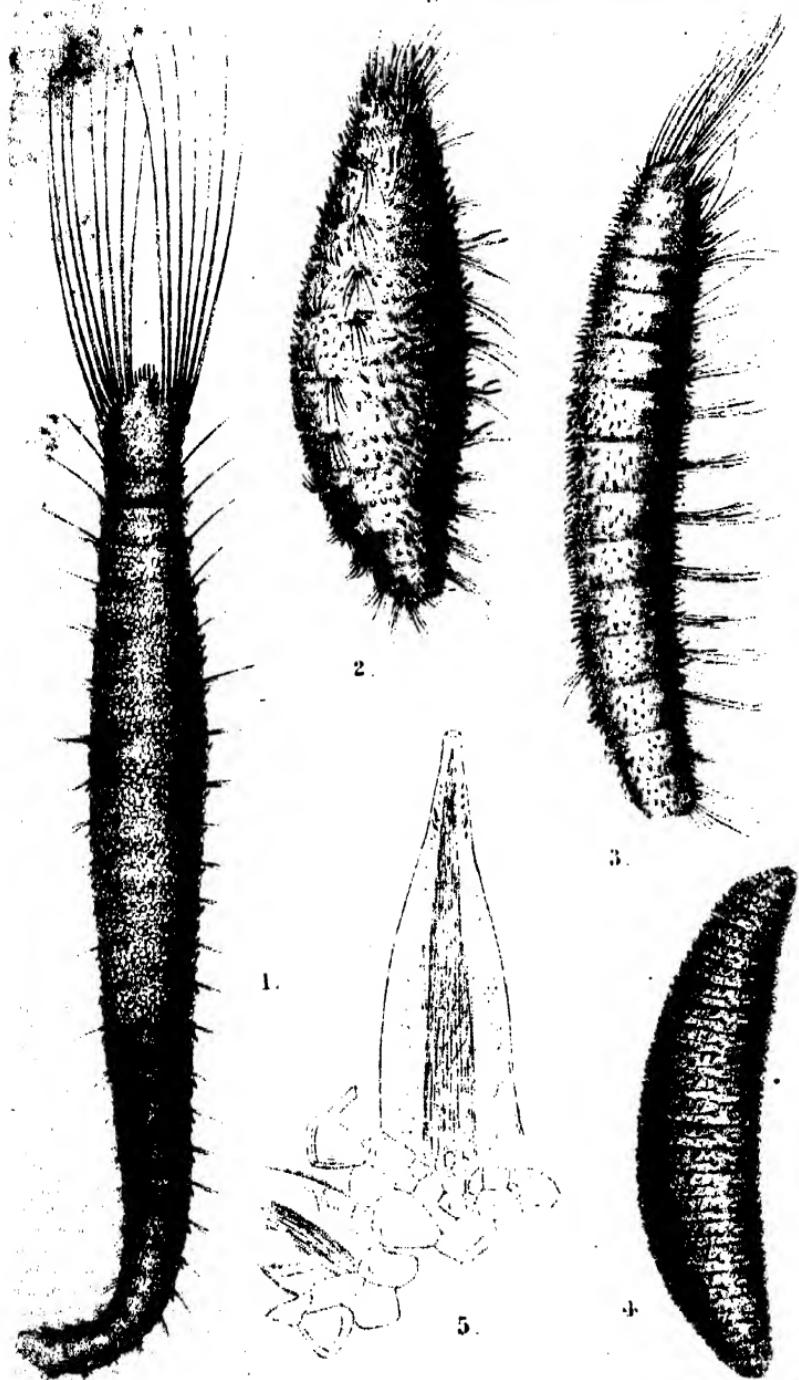
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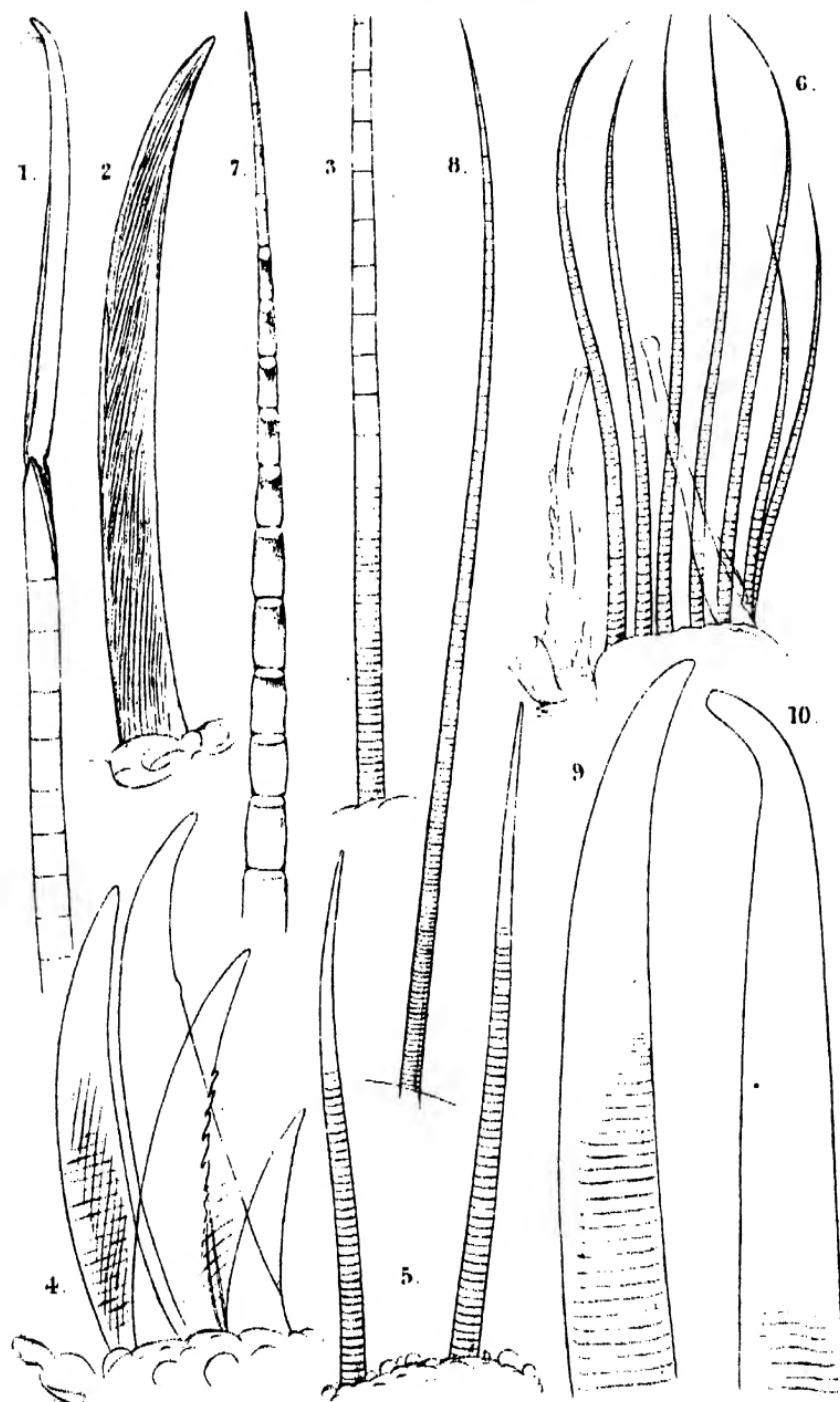
HYBRID BREAM-FLAT AND RUDD.
Abramis blicca X *Labeo erythrophthalmus*.

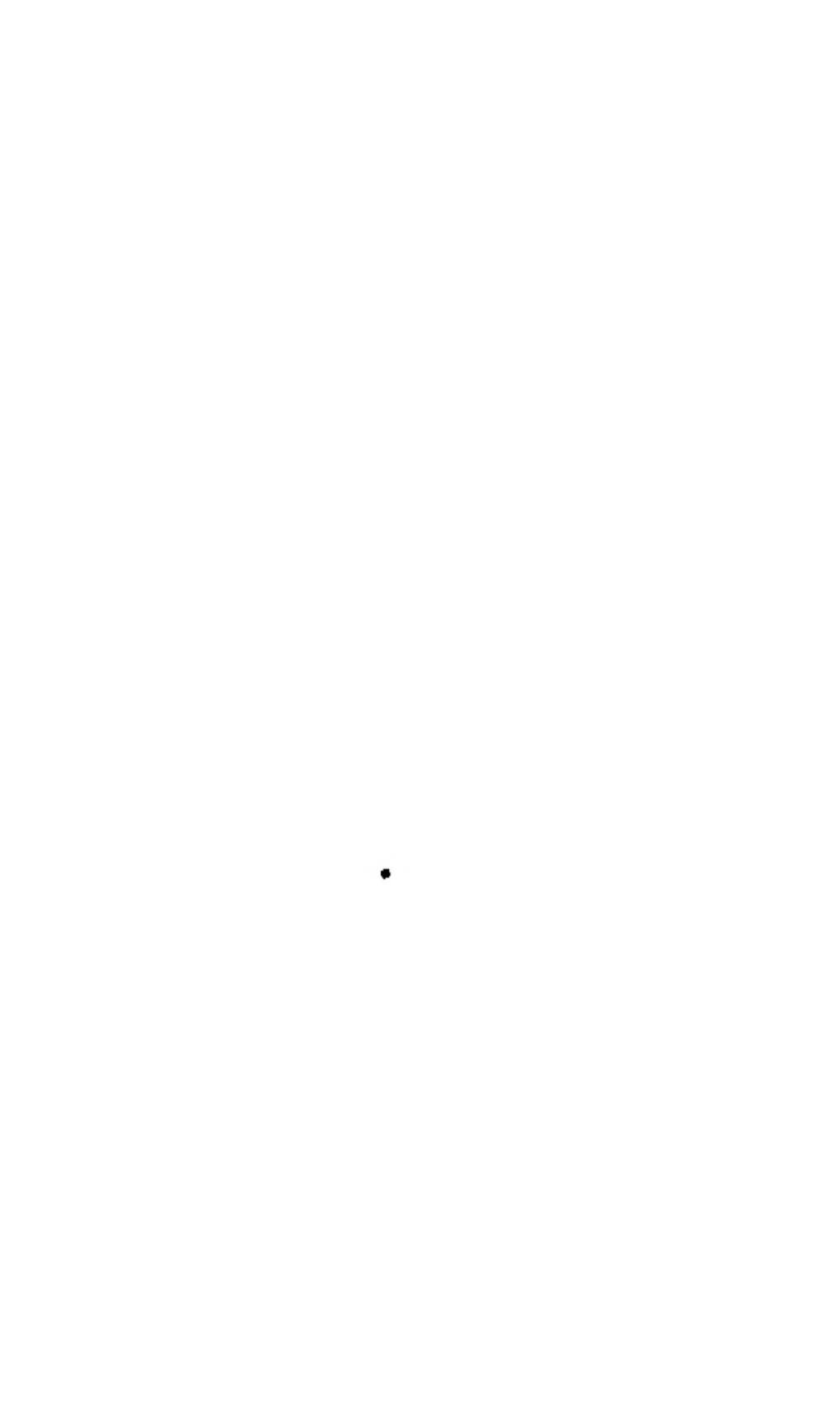


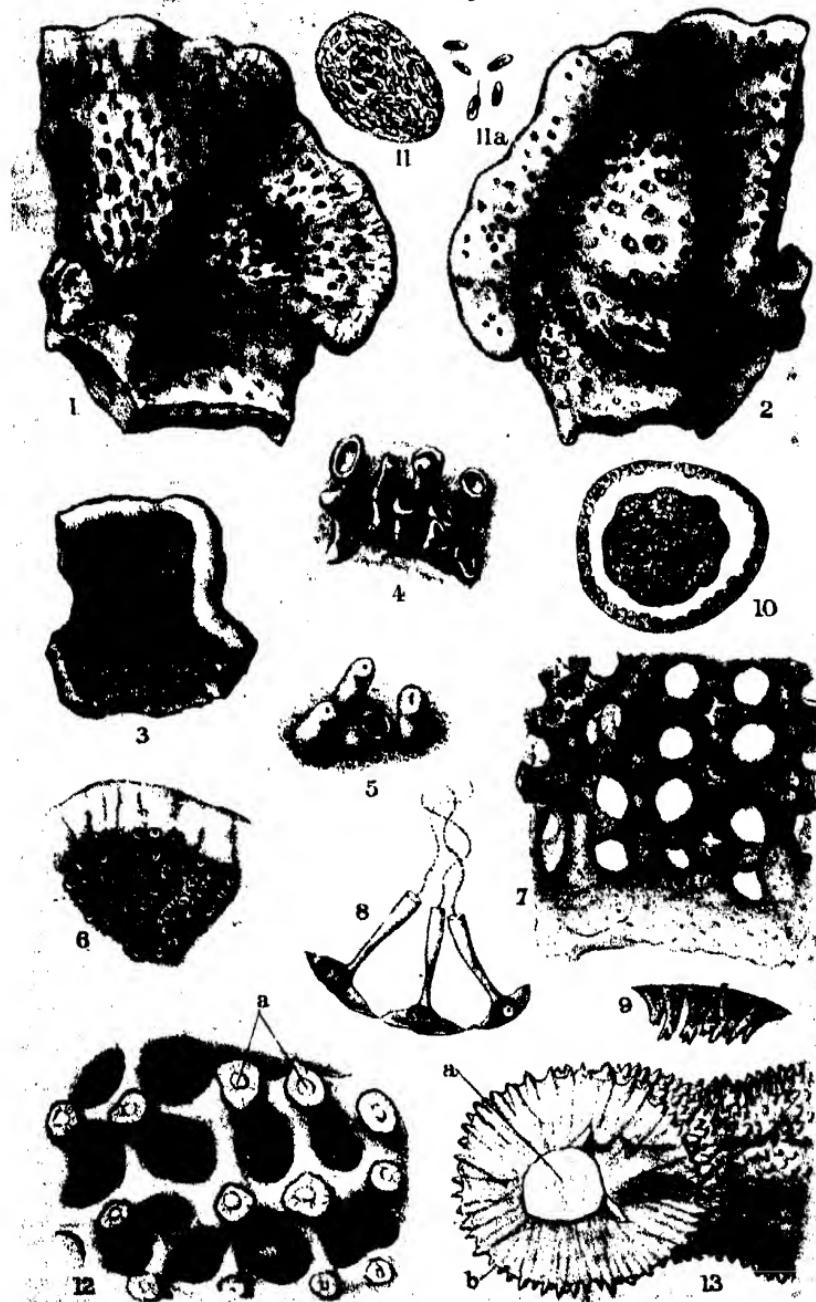


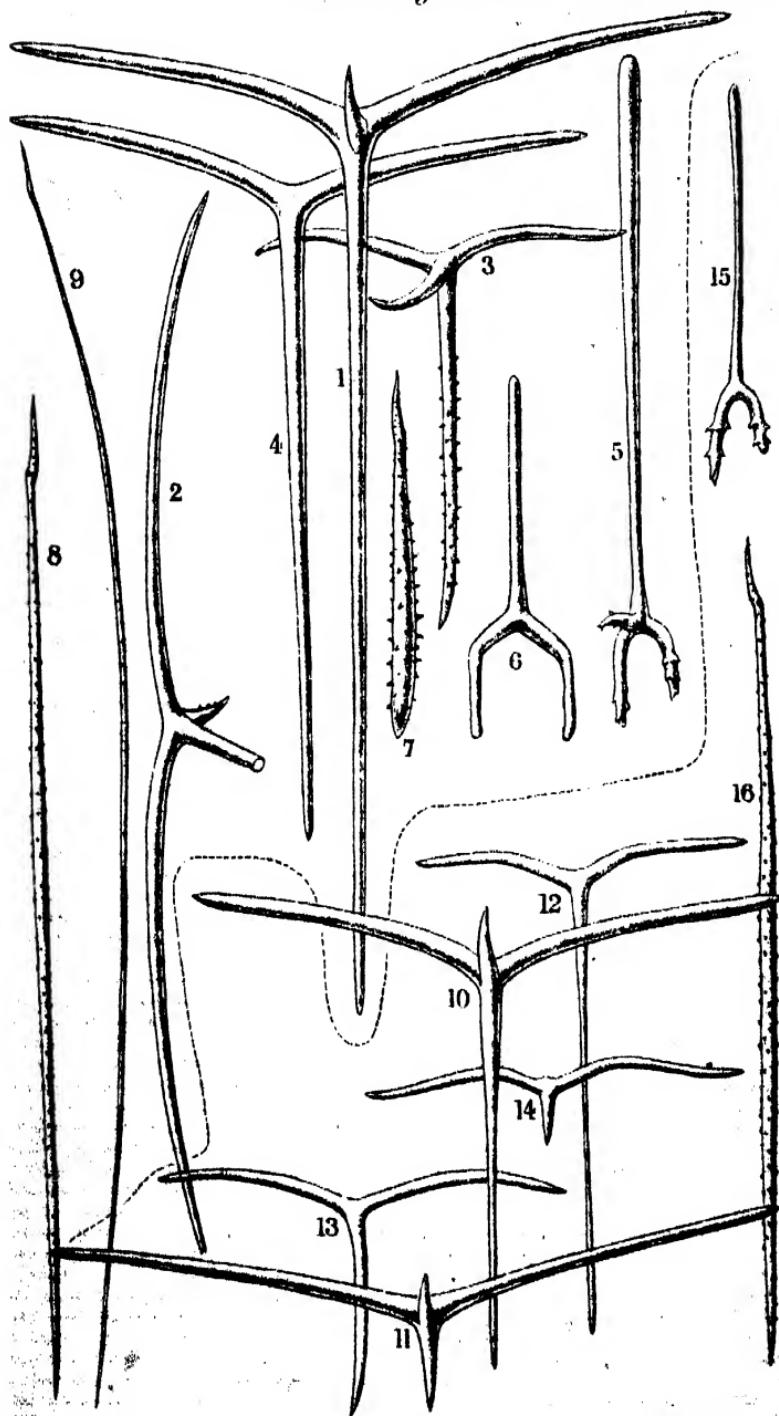


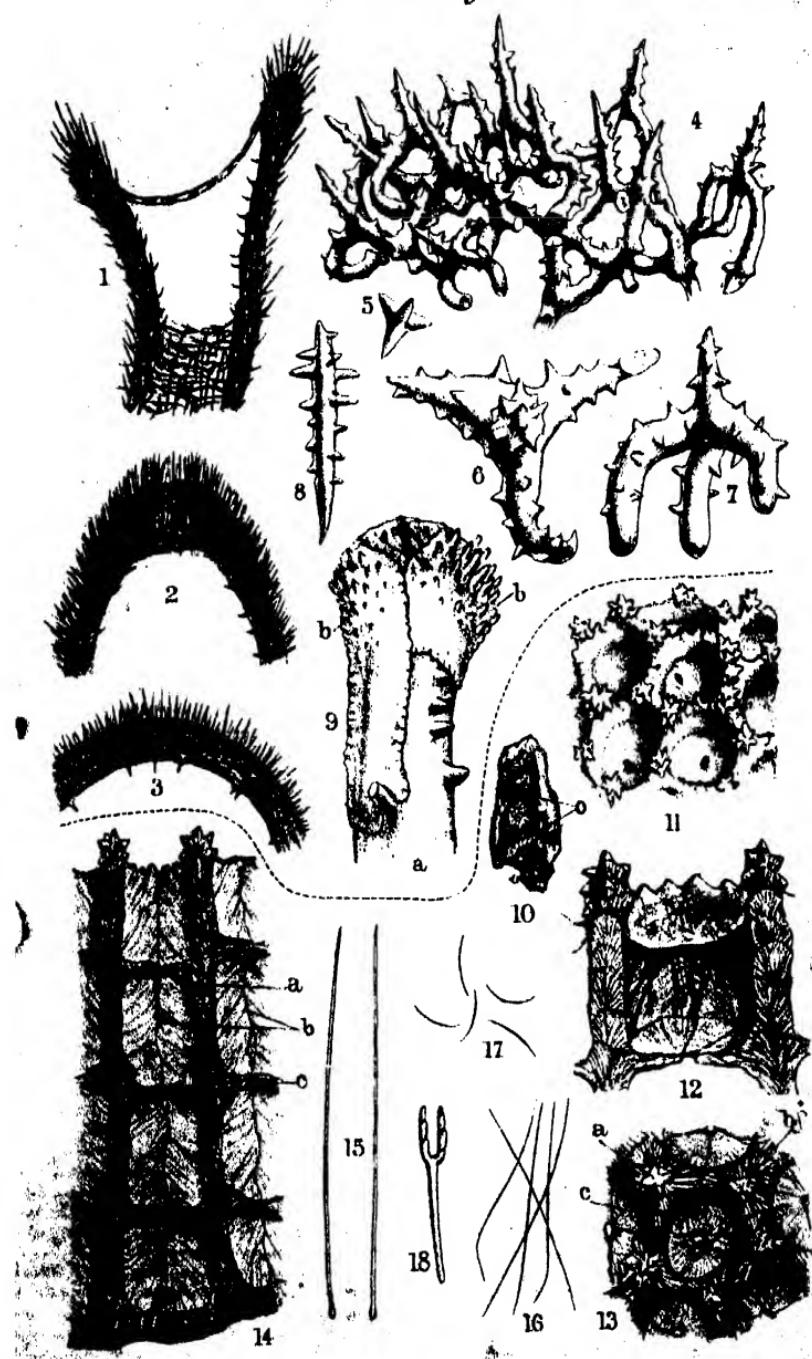












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